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ABSTRACT

This collection of papers includes both presentations at a two-day conference of the Education Advisory Council at Apple Computer which considered information and insights on the use of telecommunications and networking in education, and papers describing other telecommunications projects that have been identified since the council's meeting. Following an introduction by Randy Pennington, 18 papers are presented under five headings: (1) National Networking Systems: "SpecialNet: A National Computer-Based Communications Network" (Alfred J. Morin); "Chieffile: The Electronic Mail, News, and Information Service of the Council of Chief State School Officers" (George Rush); and "MIX--The McGraw-Hill Information Exchange" (Stephen M. Laliberte); (2) Statewide Networks: "Florida Information Resource Network" (Francis C. Watson); "New Hampshire--A Case Study: Getting Started in Educational Telecommunications" (Molly Watt and Dan Watt); "Communications--How AppleLink Improved Apple's Information Flow" (Stacey Bressler); "Superintendents at the Workstation?" (Larry Vaughan); and "METN--Networking in Maryland" (Michael F. Sullivan); (3) Community-Based Networks: "Learning Link--A Model for Low-Cost Educational Networks" (Robert A. Spielvogel); "CMS School-Net--A Practical Approach to Effective School Networking" (Al Rogers); "Connected Education--The First Two Years" (Paul Levinson); and "The Network Advantage in Education (for the Apple Macintosh)" (Carl M. Durance and Shirley L. Fenton); (4) Distance Learning Projects: "Distance Learning in Alaska's Rural Schools" (William J. Bramble); "Telecommunications and Distance Learning Systems in New York State" (Peter Frederick Stoll); and "The Hawaii Global TELEclass Project and Multimedia Computer-Based Educational Telecommunications (CBET)" (John H. Southworth); and (5) Summary: "Session NOTES" (Larry Vaughan); and Commentaries: "Networking in Education--The Need for Managerial and Political Innovations" (Charles L. Blaschke); and "EUREKA!" (from "An Electronic Net-Rider's Journal," Gerri Sinclair). The text is supplemented by various figures, tables, and illustrations, and many of the papers contain bibliographic references. (EW)

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Toward a
Seamless Society

Networking
In Education

LEARNING · TOMORROW

WINTER 1988

The
Journal
of the
Apple
Education
Advisory
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Toward a Seamless Society

Networking the Education Community

Apple Education Advisory Council:
Learning Tomorrow Series

Dear Reader,

In November 1986, a group of educators met for a two-day conference of the Education Advisory Council at Apple Computer. The purpose of this gathering was to share information and insights on telecommunications in education. Participants included educators involved in a wide range of telecommunications projects. Some of them addressed the need for improved information flow among administrators; others described systems designed to enable teachers and students to access new sources of learning materials.

The conference provided an opportunity for discussion of major issues, successes, and stumbling blocks in the quest for an "on-line education community." Since the Council's meeting, other key telecommunications projects were identified, and their creators were asked to contribute papers describing them. This book, then, is the compilation of project descriptions and the thoughts of many of the key players in the rapidly expanding field of telecommunications in education.

The Education Advisory Council is Apple's ongoing forum to identify important issues in contemporary education and technology, and *Learning Tomorrow* is a series of publications showcasing the contributions of its participants. This book is the fourth in the series.

The views expressed in *Learning Tomorrow* do not necessarily represent those of Apple Computer; they are, instead, the diverse views of some of the best people in the field, presented to give readers an overview of current opportunities in networking and telecommunications in education.

We welcome your comments on *Learning Tomorrow*.

Sincerely,

Sueann Ambron

Sueann Ambron
Manager, New Technology for Education
Apple Computer, Inc.

Randy Pennington

Randy Pennington
Manager, Strategic Education Sales and Marketing
Apple Computer, Inc.

Credits

Managing Editors: Sueann Ambron
Assistant Editors: Ferhan Cook, Carol Johnson
Creative Director: Thom Marchionna
Designer/Illustrator: Ellen Romano
Account Manager: Stri Elkaim
Print Production Coordinator: Linda Franklin
Copy Editor: Teri Twombly
Text Format: Andrea Stedman, Kathy King
Coordinators: Rachel Cohen, Carol Johnson

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Introduction

Randy Pennington

> *It is time for some of us in education to lead the technology rather than to be led by it. If we are up to the task, then the next decade will be rewarding and creative in terms of combined technologies, applications, and needs—bringing education to a level we have never before dared contemplate. . . . If I could have spontaneous access to other references and sources of information, I would start to come close to the "seamless carpet of learning." . . .*
>
> *. . . I cannot help recalling the words of the late Russell Schwikert, an Apollo IX astronaut, who, as he was circling the earth and looking down at the small sphere we call our global village, was heard to say: "You look down there, and you can't imagine how many borders and boundaries you cross, again and again, and you don't even see them. . . . From where you see it, the thing is a whole, and it's so beautiful."* *

Telecommunications is a technological application that enables the flow of information across boundaries. The boundaries can be from room to room, town to town, country to country, or just mind to mind. As educators, our goal is to facilitate that flow, so that those boundaries cease being barriers to communication.

Children entering kindergarten in 1988 will graduate from high school in the year 2001. During the school years of these students, we will see the evolution of new educational delivery systems to prepare them for life in the twenty-first century. Networking the education community is part of this future.

Telecommunications is the social side of the technological revolution. When groups go on-line to conference with other groups, learning occurs on both sides of the interface. Students experience the world beyond the limits of the classroom. They are motivated to augment their communications skills, because they have a reason to communicate effectively.

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* Gabriel D. Ofiesh, "The Seamless Carpet of Knowledge and Learning," *CD ROM: The New Papyrus*. Steve Lambert and Suzanne Ropiequet, Eds. Redmond, Washington: Microsoft Press, 1986.

Telecommunications in education also addresses the issue of equal access. Rural residents and the disabled are among those who can connect to the mainstream of the education system through on-line communications. Potential learners who are isolated by their environments or by their disabilities can now receive the same educational offerings as their peers.

The early 1960s saw the emergence of large administrative computing systems. Mainframe computers, networked together, gathered and disseminated large quantities of information. For those groups fortunate enough to have access to these machines, information sharing was possible. In the late 1970s, the emergence of microcomputers gave a new focus to distance networking. Computing workstations appeared on more desks in more homes and offices, serving as terminals for communication; a new and valuable tool was discovered. With lower cost and increased availability, networking became an attractive option for information sharing.

Now, in the late 1980s, we are reaping the benefits of these past efforts to link computers for communication. The projects discussed in this book cover a wide range of networking options. Some of the programs primarily serve administrators in their needs for information sharing and control of data flow; these offer unique tools to enable the business of education to be conducted with maximum efficiency. Other programs serve teachers and students, allowing them access to vast stores of knowledge and enabling them to communicate with each other.

The persistent concern about system obsolescence has caused hesitation among administrators interested in implementing on-line programs. Lessons learned from the projects discussed here suggest that longevity can be achieved through careful planning and assuring built-in expansion capability.

That some type of networking system is vital in the contemporary world of education is obvious. Since every school system has unique communications needs, the specifications of a telecommunications program will vary. It is Apple's purpose to help educators identify and meet their own needs, taking lessons from the pioneer projects described here.

To plan for a startup telecommunications program, goals and objectives must be defined. First, the user population must be determined. A different system configuration will be required for an administrative system than for a teacher–student program. If the system will be used by teachers and students, placement of hardware in the school becomes an issue. Will media center coordinators and librarians interface with the system, or will teachers have access in the classroom?

In a teaching-centered system, primary consideration must be given to overall curriculum objectives. New technology enables new means of information access and new ways of teaching. The goal of classroom telecommunications should be to integrate these into the existing curriculum.

Ease of use should be a planning objective. An on-line system is optimally successful when its participants log on regularly, and regular usage is directly correlated with user comfort. Once the participants feel confident with the hardware and software, they create new applications, find time-effective shortcuts, and thereby expand the limits of the system.

Although the characteristics of the individual projects differ, common directions can be noted. First, the technology is increasingly sophisticated, enabling greater connectivity among disparate operating modes. System capabilities are increasing with regard to both number of tasks performed and geographical areas served. Second, startup time and costs are decreasing relative to system capabilities. The mistakes made in the past enable better planning in the future—we can build on previous experience. Third, applications are proliferating. As more and more groups come on-line, more innovative programs are created to add value to the system. Finally, computers are becoming easier to use and more accessible. With an increasingly transparent interface to the networked world, the computer becomes a simple tool for complex communication.

This positive flow of trends suggests that it is becoming easier and more effective to establish on-line education support systems. Technology and understanding are developing so fast that present goals will be met and surpassed. It is our belief that the administrative and instructional networks that come into existence in the future will build on projects like those discussed here. But the future systems will be both more complete and more substantial, and they will answer more needs. As we move toward a "seamless society," we will begin to overcome most of the financial, technical, and political barriers discussed in this book.

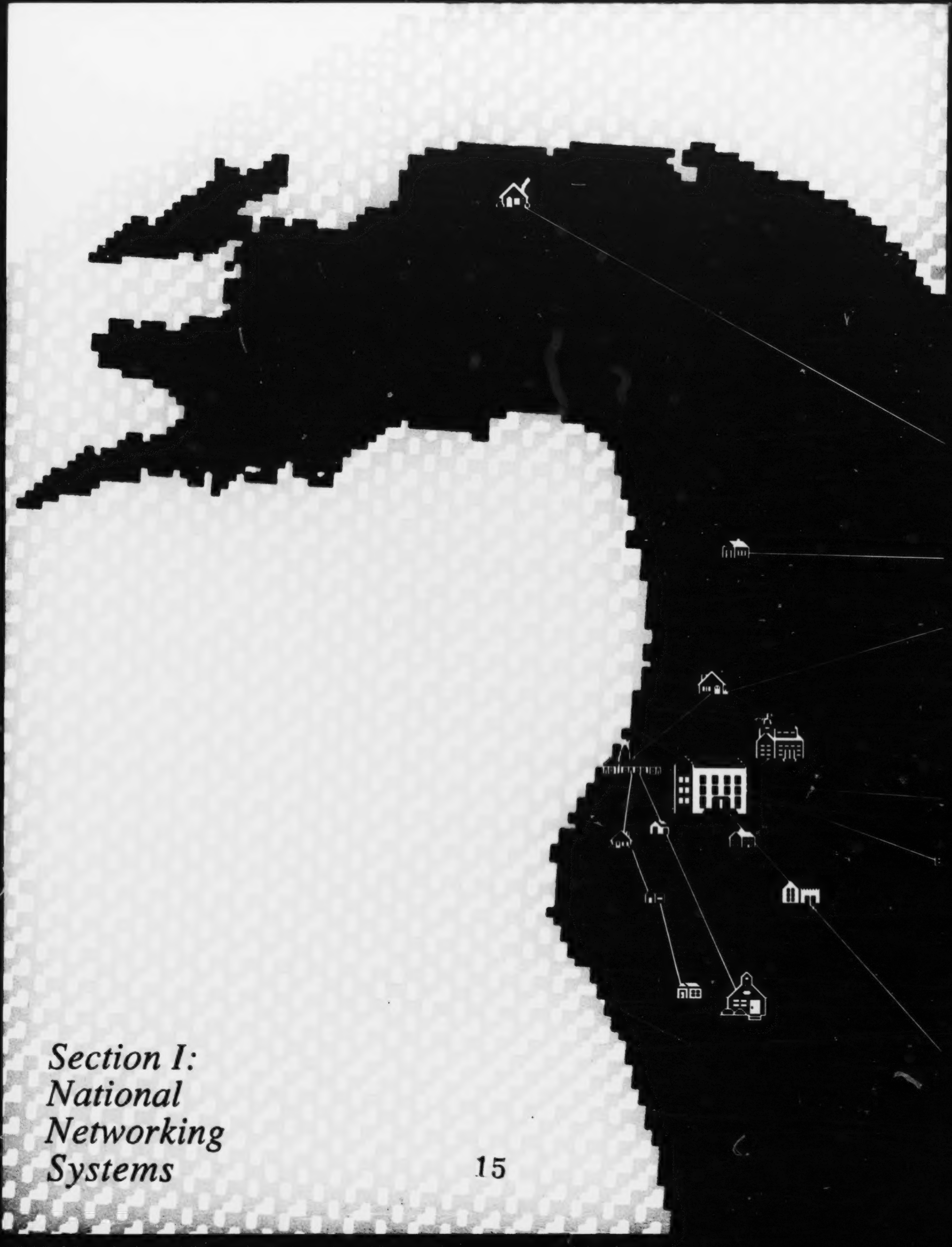
We are pleased to offer here a glimpse of the field of telecommunications in education today, and we hope that this overview stimulates your vision of the future. We can learn and borrow from all of the pioneering projects discussed here, to achieve the goal of delivering the optimal education system for the needs of the twenty-first century.

Randy Pennington

Randy Pennington, currently Manager, Strategic Education Sales and Marketing at Apple Computer, has been committed to furthering the use of technology in education throughout his career. While at Apple, he has participated in the initiation of several pilot projects dealing with statewide administrative networking. Serving as principal of Decatur (Georgia) High School from 1977–1984, he established a teacher support system there using applied educational technology. This program received both state and national recognition.

Since 1980 he has served as an educational technology consultant for the U.S. State Department Overseas Schools, as well as for the Association of Supervision and Curriculum Development. He has also been a member of the Georgia State Department of Education Committee on Computing, and director of educational technology for the Georgia Department of Education.

Mr. Pennington received his B.S. in Education and Physics and his M.Ed. in Educational Administration. He resides in the San Francisco Bay Area with his wife Malinda and their nine-year-old daughter Maranda.



Section I: National Networking Systems

National Networking Systems

Large, powerful national and international computer-based networks, such as The Source, Telenet, and CompuServe, enable users to access and transfer huge amounts of information. The educational telecommunications systems described in this section are in many cases subsystems of these networks. They began with the premise that their user base was located across the country, and had need of the efficiency and speed of asynchronous computer-based communications. Of the available programs nationwide, this selection will give the reader a taste of what is possible with this type of program.

SpecialNet is the "Special Network for Educators" operating on the Telenet network. SpecialNet features numerous bulletin boards on specialty topics within the field of education, with an emphasis on serving the needs of the special education community. One of the oldest operating education networks, this system is large enough to accommodate the creation of customized bulletin boards. Both teachers and administrators will find a variety of conferences that will strengthen their knowledge base.

Chieffile was established by the Council of Chief State School Officers as an administrators' information-exchange service, accommodating the need for rapid communication between the Washington, D.C. headquarters and the state organization members' e-mail systems. By agreement with the National School Public Relations Association, Chieffile is a subnetwork of NSPRA's ED-LINE, transmitted by The Source. In his paper, George Rush describes the variety of information available in the Chieffile program.

Stephen Laliberte describes McGraw-Hill's MIX program, a nationally available commercial electronic publishing and information-exchange service. With a combination of conferencing, data-base access, and e-mail, MIX offers extensive resources to its constituency of education and media professionals and technology coordinators.

SpecialNet

A National Computer-Based Communications Network

Alfred J. Morin

SpecialNet is a computer-based communications network operating on the Telenet packet switching network and managed by National Systems Management, Inc. (NSMI). Users can send and receive electronic mail, share information on electronic bulletin boards (see Appendix), participate in electronic conferences, and send reports and other documents to each other in a timely manner. Some users even download data files that have been created at a lower administrative level and moved electronically to a higher administrative level for analysis and reporting.

The name "SpecialNet" was chosen to signify a Special Network for educators at all administrative levels. Originally, the network was designed by experienced educational professionals at NSMI, who identified the need for more and better flow of decision-making information at all levels. The variety of education business now conducted daily on the system would probably astound us all. There are several features of SpecialNet that can help reduce, even eliminate, much of the daily burden of paperwork management. The following examples identify recurring activities in which SpecialNet could be used to reduce the paperwork load.

Electronic Mail

Each Monday morning a memorandum is created at a state agency office and mailed to each local superintendent of schools. Drafting the memo, typing the final version, duplicating the necessary quantity, addressing envelopes, folding and stuffing, affixing postage, and hauling the bags of letters to the mailroom takes all morning. Surface mail will usually have all the letters delivered by Wednesday.

Using a previously prepared list of on-line users, the same memorandum can be waiting in each superintendent's SpecialNet electronic mailbox within minutes after it has been typed.

A school district is revising the Student Handbook and would like all building principals to review and comment on the proposed changes. The draft revisions are typed and a cover memo prepared; both documents are duplicated, the envelopes are addressed and stuffed, and the packages are placed into the district's internal mail system. All principals will have the proposed changes by the following day and should be able to provide their written comments within three to five days.

SpecialNet will deliver the cover memo and handbook revisions to each principal within minutes after they are typed on a word processor and can have the comments back to the superintendent's office the same day.

Electronic Bulletin Boards

The office of the state superintendent of schools prepares and distributes an average of three announcements per week intended for reading by principals and classroom teachers within each local district. When the document arrives by surface mail at the local district office, it may be duplicated and distributed to all building principals for posting, or it may be filed as an insignificant mail piece.

The same documents can be sent on SpecialNet to a state-administered bulletin board maintained specifically for principals. Each school building reads and downloads new items daily and posts the appropriate information in the teachers' lounge—guaranteeing that each item will be available to every teacher in the state.

A request for a specific large-print textbook is prepared by a classroom teacher. After the building principal approves the request, it is sent to the local district office. If a search for the book indicates it is not in any media center, the request is forwarded to the appropriate state office. The request might be forwarded again to a regional agency for loan or procurement. The teacher may not actually receive the requested book for months—possibly never.

The district could place the request for large-print material on the SpecialNet VISION electronic bulletin board, which is monitored by districts and national vision agencies throughout the United States. A respondent would indicate a source for the needed large-print text, along with any related costs, and send an acknowledgment within a few days directly to the district making the request.

Electronic Conferencing

The state agency is preparing new guidelines on student eligibility for varsity athletics related to academic standing. Athletic coaches from all local districts are asked to attend a one-day conference at a central location to discuss this issue and provide guidance to state staff responsible for preparing the new guidelines. Many cannot attend because of prior commitments, while others cannot locate substitute coaches to conduct their physical education classes. Those who attend provide a limited perspective and impatiently question the significance of the issue.

A SpecialNet electronic conference would allow all coaches to provide comment at their own convenience without leaving their districts. They could also react to the comments of others without strong personality overtones. The conference findings would be shared electronically by all participants.

A local superintendent wishing to obtain comments on a particular topic from all building principals asks them to attend a meeting at the central office. The superintendent presents the issue and solicits comments from the principals in attendance. The day-long meeting concludes with a reading of the major comments and a statement by the superintendent on the possible outcomes as a result of the meeting. The principals return to their respective buildings past the end of the school day and must wait until the next day to resume important administrative matters.

The superintendent's single-issue statement could initiate a SpecialNet on-line conference; all principals could provide comment and react without attending a meeting. Follow-up comments could be added after each principal had an opportunity to think about the earlier comments made by others. The superintendent could request additional information on items that seemed promising. All principals could continue to administer their respective buildings as they participate in the conference over a one- to three-day period.

The SpecialNet network has been in operation since 1981 and continues to expand in both services and users. Every state education agency is a subscriber, as are all local education agencies in about 20 states. In the remaining states many local districts subscribe even though it is not mandated by their respective state departments of education. In addition, many colleges and universities, private schools, and special interest organizations use SpecialNet as an administrative communication medium.

Requirements to Go On-Line

Almost any computer or word processing machine with telecommunication capability can be used to access SpecialNet. Users pay an annual subscription fee in addition to connect charges while they are on-line. Discounts are provided to large organizations with many users; connect charges are discounted to all users. SpecialNet users enjoy the lowest connect rates available for any network service currently offered in the United States.

The system operates 24 hours a day, every day of the year, from any telephone in the 50 United States. This 24-hour access is especially important in reducing communication problems caused by different time zones. Users send and receive information when they are ready and able; interruptions in meetings and "telephone tag" are virtually eliminated. SpecialNet can also be used to communicate with about 70 other nations by electronic mail, Telex, Mailgrams (Xpress Mail), TWX, or DDD.

Technical Assistance and Support

SpecialNet subscribers have access to a variety of technical assistance and support services:

- Analysis of local communications requirements with identification of cost to be achieved from adopting a computer-based communications approach.
- System design to meet local information and data processing needs including specially tailored local services such as bulletin boards, closed user groups, list development, forms design for data collection, and other on-line features available through the network.
- Free training including instruction guides for self-paced learning, slide programs, and telephone assistance. On-site training using projection equipment is also provided to large organizations.
- Cost accounting records showing monthly summaries of activities for each user, along with optional group usage statistics and management reports, are provided to assist state and local education agency finance and administrative offices.

High Professional Standards

SpecialNet users include state and local administrators who need to collect, use, and disseminate information. Aside from the practical value of increased efficiency in agency messaging at all levels, users also communicate with colleagues in other agencies. The on-line interaction with decision makers across the nation is a most unusual relationship. The increased growth of the network is a result of the continuous sharing of information for a common purpose. Both common and unique problems in education can be shared with other professionals. This dynamic, daily interaction with other users is the key feature of SpecialNet. The "feeding of the intellect" occurs at many levels; SpecialNet lets users find the level at which they are most comfortable.

The network provides an ideal mechanism to support the information flow needed by professional educators. Information is timely, responsive, practical, and drawn from real-life experiences. SpecialNet is a highly focused system for education professionals.

The quality of the administration of the many parts of SpecialNet assures a high standard of interaction among the users. Advertising is not allowed, nor is the posting of messages that extol a new product or service unless the writer is describing personal experience. System users know they will not be bothered with insignificant matters. When they are asked to assist in a particular situation, they know that someone out there is trying to solve a real problem with real students. SpecialNet users take pride in knowing that their contributions, large or small, can make a difference in the future of a student.

System Flexibility

As you can see, the system is very flexible. It is designed to accommodate many different applications and many diverse needs. The system can be customized to solve a particular communication problem. "Special Networks" can be established with different costs from those associated with SpecialNet.

We recognize that many potential educational users are not particularly interested in the information available through SpecialNet, although they may have a need to communicate with SpecialNet users via electronic mail. Superintendents, school lunch administrators, transportation officials, finance officers, and vocational education staff come to mind as potential beneficiaries of this technology. Some of these groups may simply require the electronic mail function; others may need private bulletin boards accessible only to members of their group, while still others may also need to access huge data bases with thousands or even millions of records on-line. Taking advantage of the hierarchical structure of the network and using the new gateway for access to powerful mainframe computers operating sophisticated data bases, NSMI can develop a Special Network for any of these groups. Costs for such Special Networks depend upon the specific requirements of the group, and are not necessarily related to those for SpecialNet.

Expansion to Meet Future Needs

SpecialNet can grow at an almost unlimited pace, thanks to the communications technology Telenet already has in place. Almost overnight, SpecialNet could be expanded to bring every administrator and every classroom teacher in the nation on-line. But studies of the advancing technology in the education market tell us that in order to bring all the nation's educators on-line, we must offer some exceptional types of services. The network expansion opportunities currently being implemented by the administrators of SpecialNet include the following selected examples:

Gateway Access to Other Hosts

Using several host computers to provide a variety of services and information bases creates confusion for the user. Each host has its own electronic address, user name, and password. An electronic gateway will allow the SpecialNet user to sign on just once but be able to access a variety of other host computers. Specialized, sophisticated data bases can be established for users who need them while making access to them as easy as a single sign-on to SpecialNet.

Development of Specialized Data Base Services

The first specialized data base service to be offered on SpecialNet is one currently being established by the American Printing House for the Blind (APH). The data base and associated accounting system will reside on the APH Hewlett Packard computer. Teachers of blind and visually impaired students across the nation will have on-line access to the APH catalog of more than 100,000 items available for purchase. Materials can be ordered and paid for while on-line. The vendors who supply the materials will have access to their part of the catalog to update prices and item descriptions and add new entries.

Creating Parallel Networks

Establishing a new network with many users requires that a service be in place before potential members are willing to sign on. Establishing a network within SpecialNet, but with its own identity, can hasten the process of bringing on new members whose primary interest is focused on a subset of the information available on the larger system. LitLine, for example, is a national network for adult literacy. It is available to agencies or individuals who currently subscribe to SpecialNet, for a small additional subscription fee. New members enjoy all of the services of SpecialNet, but also conduct their own focused group activities. This federally mandated, nationwide network provides its members direct access to educators, volunteers, businesses, resource organizations, policy-makers, advocacy groups, and others interested in adult literacy.

Utilizing the same computer-based communications technology available with SpecialNet, independent networks, also managed by NSMI, allow special interest groups to conduct their business in total privacy. In California, for example, a group of educators established SchoolNet several years ago as a closed system for their own private use. This network has grown considerably and continues to make use of electronic mail almost exclusively, according to the wishes of the membership. In another example, a national consumer advocacy group, working with the Office of State Attorney Generals, is establishing an independent network to monitor utility costs and related legislation at state and federal levels nationwide. The Council of State Administrators of Vocational Rehabilitation developed a highly successful network that operates in a similar fashion. A final example is a custom software house with major clients in national banking. The firm is establishing an independent, nationwide network to provide ongoing technical assistance to customers using the many features of the special applications packages it develops.

Statewide Data Collection Systems

There is a continuous need within all state governments to move educational data from the local school building to the state's mainframe computer, sometimes with intermediate stops along the way. SpecialNet administration is currently working under contract with one such state agency to accomplish the required data transfer in a simple and efficient manner. Special software will allow classroom teachers to input building level student data to Apple® computers. Selected data will be transmitted to a District Office computer via SpecialNet. The data will be used at that level for summary administrative purposes and, once again, selected data will be transmitted via SpecialNet to a state level small computer. The state level computer will produce required summary reports and eventually be used to pass the data along to the state mainframe—all with the aid of SpecialNet. The savings in leased lines for the first year alone will pay for all development and installation costs.

Improved Communications Software

While computer-based communication seems easy to those of us who use it daily in our work, uninitiated users do not share the same opinion when they go on-line the first few times. New software that makes it an effortless activity to go on-line, send and read mail, and check bulletin boards is on the way. The new software to be made available to SpecialNet users will greatly reduce new user apprehension about going on-line and also make the experienced user even more efficient. It can totally automate the computer-based communications process, which will reduce connect time, which will reduce user on-line costs.

National Systems Management, Inc.

National Systems Management, Inc. (NSMI), developer and administrator of the SpecialNet system, has been providing a wide range of electronic communications services for a variety of small and large groups since 1981. Working directly with Telenet, NSMI has become a nationally recognized value-added service provider for the Telemail system. Groups using NSMI–developed networks find they can increase their information processing efficiency, thereby allowing more time for business matters. Easy processing is especially helpful to the nontechnical user who has little opportunity to learn complex procedures and command structures. Time-on-task is critical to administrative effectiveness. NSMI recognizes this important aspect of electronic communications and is committed to ensuring that all of its networks provide increased efficiency in business administration and information management.

Appendix: National SpecialNet Bulletin Boards

AIA The AIA (Artificial Intelligence Applications) bulletin board provides information regarding the development of expert systems (ES) with application to special education. This information includes reports and editorials on recent events about the development of ES programs, conferences, and reviews of books and articles. AIA is managed by Utah State University and its User Name is UTAH.USU.

AIDS The AIDS board endeavors to keep users up to date on developments about Acquired Immune Deficiency Syndrome by posting both news stories and full texts of important documents concerning AIDS. The board is managed by EDLAW, Inc. and its User Name is EDLAW.

APPLE Apple Computer's Office of Special Education Programs (OSEP) manages this technical assistance bulletin board. OSEP posts announcements of model special education computer programs and applications (including new and important products from third parties) on the APPLE board. The board also offers an efficient vehicle for raising and responding to questions, concerns, and wishes of the special education and rehabilitation communities. The Apple OSEP SpecialNet User Name is APPLE.OSEP.

ASHA.UPDATE Provides information on speech, language, and hearing for individuals interested in sharing ideas and resources on these topics. The American Speech-Language-Hearing Association (ASHA) announces national office, committee, and board activities on this board. Other topics covered include federal and state legislation, workshops, advocacy activities, new policies and positions, clinical practice procedures, and licensure and certification information.

ASSESSMENT Established in response to requests from subscribers, this board provides a place where educators can communicate directly with test developers and publishers about tests and assessment instruments. Publishers post announcements of new assessment instruments.

BILINGUAL Focuses on promising practices, legislative action, research, conferences, and so on, related to the area of bilingual special education. The Bilingual bulletin board is managed by the Handicapped Minority Research Institute on Language Proficiency at the University of Texas at Austin.

CAREER.CONNECTION Contains information about individuals seeking employment. Brief information about each applicant is displayed. If you are looking for candidates to fill job openings in your agency, you may find just the person you are looking for by scanning the CAREER.CONNECTION board. The board is managed by National Systems Management, Inc. and its User Name is NSMI.

CEC.NEWS Communicates information about activities of the Council for Exceptional Children (CEC), including activities of the national office, governing bodies, state and provincial federations, divisions, committees, and other CEC units in the United States and Canada. Messages can be posted by CEC headquarters staff and officers of CEC units.

CHAIN Establishes a link between parent coalitions, alliances, and other groups to share information on topics of vital interest to parents, including legislative issues, parent training programs, and resources and services available for parents.

COMMUNITY.LIVING Provides a vehicle for sharing ideas, projects, research, training, and best practices specifically related to the needs of handicapped youth and adults living and working in community settings.

COMPUTER Provides information on computer applications in education. This board is managed by Education TURNKEY Systems, Falls Church, VA.

CONFERENCE Describes education-related conferences. Subscribers can list upcoming conferences by composing a message to CONFERENCE.

CONSULTANT Listing of consultants in various areas of education. Any consultant can be listed. No judgments are made on consultant qualifications.

CSPD Acronym for Comprehensive System of Personnel Development. This bulletin board includes training programs, statewide CSPD activities, in-service meetings and seminars, books and media useful for professional development, and related items. Users are invited to check this board at least once each week, since its contents are not stored.

DEAFNESS Provides a forum for users interested in all areas related to the hearing impaired: notices of upcoming regional, national, and international meetings and activities; brief summaries of useful techniques, strategies, and materials; requests for information and technical assistance on deafness-related topics, and brief summaries of research studies.

DEAF.UPDATE Contains information generated by Gallaudet University. Users are able to access and print out information related to mainstreaming, technology, and research as it relates to education of the deaf.

EARLYCHILDHOOD Lists information pertaining to services for handicapped children from 0–8 years of age, including early childhood projects, promising practices, curriculum materials, and conferences.

ED.DAILY News from Education Daily, published every business day by Capitol Publications, Inc., available instantly via SpecialNet. This bulletin board provides coverage of congressional action on important education legislation; civil rights lawsuits; activities of federal, state, and local education agencies; and federal programs such as Chapter 1 and PL 94–142. To access the ED.DAILY bulletin board, you must subscribe to Education Daily as well as SpecialNet.

EMPLOYMENT Listings of employment opportunities in education. Any subscriber can send announcements to this bulletin board by composing a message to EMPLOYMENT or by completing an on-line position announcement form.

EXCHANGE Facilitates sharing of information and ideas among SpecialNet users, who can request technical assistance, exchange strategies and project data, and transmit general information.

FEDERAL Focuses on information from Washington for administrators in special education: what is happening in Congress, including notices posted directly by key Congressional committees such as the Senate Select Committee on the Handicapped; activities, new regulations, and policies from the Office of Special Education Programs in the Department of Education; and other legislative and executive news from national associations and organizations.

GIFTED Includes information on counseling, career guidance, curriculum and instruction, program evaluation, teacher in-service, funding, identification, administrative options, and conferences as they relate to education of the gifted.

INTERNATIONAL Brings together persons willing to share information and learn what is happening in education internationally, develop partnerships for participation in international educational events, and contribute to the quality of educational services throughout the world.

LINC.UP Facilitates the exchange of information related to the distribution and dissemination of special education products and links product developers or not-for-profit publishers and distributors. The board is operated by LINC Resources, Inc. of Columbus, Ohio.

LITIGATION Brief descriptions of court cases and hearing decisions, with references to tell where to obtain detailed information. More than 50 categorical files have been created to assist users in accessing the information (for example, LRE, IEP, SURROGATE).

MARKET Intended as a place for users to list any items they may wish to sell or trade. Used computer equipment, software, and many other items are listed by users. Any item listed remains on the board for 90 days, or until NSMI is notified that it has been sold.

MR Provides information, discusses issues, lists teaching techniques, and announces conferences related to educational programs for the mildly and moderately mentally retarded. The board is managed by the North Carolina State Department of Education.

NAPSEC.ISSUES Covers information affecting the private special education community, including federal legislation and regulation, advocacy, litigation, and activities of the National Association of Private Schools for Exceptional Children (NAPSEC), which administers the board. NAPSEC also maintains an on-line directory of private schools listed by category of exceptionality.

OPINIONS SpecialNet's "letters to the editor," providing subscribers with an opportunity to express opinions about issues in education.

PDK.CEDR Establishes two-way communication between international headquarters and chapter officers of Phi Delta Kappa, a professional education organization. PDK exchanges information about publications, exemplary research studies, and innovative programs.

PIP (Programs Involving Parents). Focuses on parent programs of interest to parents and professionals. News is included on issues and trends in parent programming, innovations, publications, meetings, networks, and projects.

PRACTICES Describes promising practices pertaining to classroom instruction, teacher education, in-service, and preservice. Each description is accompanied by effectiveness data gathered on the practice. Referrals are made by state and local education agencies, regional resource centers, and others.

PROGRAM.EVAL Provides information on program evaluation for state and local education agencies. This bulletin board contains information on conferences and events, new products relevant to program evaluation, and reports on evaluation efforts. The Mid-South Regional Resource Center at the University of Kentucky manages this bulletin board.

RFP Tracks grants and contracts issued by federal agencies of interest to SpecialNet subscribers. Programs and areas scanned include general education, special education, rehabilitation, migrant education, bilingual education, higher education, vocational education, women's equity, communication disorders, behavioral sciences, humanities, arts, health, mental health, justice, and transportation.

RURAL Serves as a source of sharing practices, programs, publications, and other resources for rural special education programs. The board is maintained by the American Council on Rural Special Education (ACRES).

SEVERE Contains information on administrative and instructional services for severely handicapped students. Includes descriptions of promising practices, curriculum materials, legislative action, research, and conferences.

SOFTWARE Offers subscribers an opportunity to share evaluations of software and information on educational software, and to ask other users for help in locating effective computer software.

SPEC.PE Provides information on the identification of service needs for handicapped students in physical education. Descriptions of promising practices, resources, and conferences are highlighted.

TECH.LINE Offers news and information about technology in special education. Audio, video, and computer-related technologies are highlighted.

TELEVISION Provides short courses on the uses of public, cable, and satellite television for education purposes. Entries include "how to's" and terminology, descriptions of TV projects around the country, information about cable companies, descriptions of effective videotapes and films for TV or classroom use, current events in telecommunications, and related information.

TRANSITION Used to share resources, strategies, and information found to be successful in helping special-needs individuals move from agency to agency and from school to employment; training, rehabilitation, residential information, and social services.

VISION Provides information on services and materials for the visually impaired. On-line technical assistance is readily available through use of the board. Many users share copies of large-print and braille text through messages posted on the VISION board.

VOCED Focuses on promising practices, research, resources, and conferences in the area of vocational education.

VSA.NEWS Provides users with information regarding quality arts programs for disabled persons. Very Special Arts, an educational affiliate of the John F. Kennedy Center for the Performing Arts in Washington, D.C., manages this bulletin board.

State SpecialNet Bulletin Boards

Many state education agencies have established bulletin boards for posting information needed by users in their states. In some cases, states have established several special-purpose bulletin boards. State boards tend to focus on state policy, legislation, calendar of events, and other areas of special interest to users in a particular state. A partial list of SpecialNet state bulletin boards follows:

- CALIFORNIA
- COLORADO
- CONNECTICUT
- FLORIDA
  - FLEX
  - FLORIDAESE
  - FLORIDASUPER
- GEORGIA
- HAWAII
- ILLINOIS
  - VACANCIES
- INDIANA
  - GEN.ASSEMBLY
- KANSAS
  - KSEX
  - KSCAL
  - KSIMC
- MICHIGAN
  - SESA.NEWS
- MINNESOTA
  - EBD.DIRECTORY
  - LOW.INCIDENCE
  - MN.SPED.POLICY
  - MN.TRANSITION
  - SPNET.TRAINING
- NEVADA
  - NVPARENTINFO
  - NVCONFERENCES
  - NVLEGISLATIVE
  - LEGISNV
- NCAROLINA
  - NCEX
  - REGION.ONE
  - REGION.TWO
  - REGION.THREE
  - REGION.FOUR
  - REGION.FIVE
  - REGION.SIX
  - REGION.SEVEN
  - REGION.EIGHT
- NEWHAMPSHIRE
  - NHEX
- PENNSYLVANIA
  - RESOURCESYSTEMNEWS
- SCAROLINA
- TENNESSEE
- WVIRGINIA
- WYOMING

Alfred J. Morin

Technology applications in educational administration have been the major focus of Mr. Morin's activities for the past 20 years. His ongoing work with state and local education agencies provides him the cutting-edge experience necessary to assist administrators in meeting the new challenges of rapidly advancing technologies.

At the time of this symposium, Mr. Morin was executive vice president for National Systems Management, Inc., a Washington, D.C., firm that operates a number of nationwide computer-based communications networks. Mr. Morin has since formed his own company, Alfred J. Morin and Associates, in order to provide a broader range of technology planning assistance to educational decision makers.

Chieffile

The Electronic Mail, News, and Information Service of the Council of Chief State School Officers

George Rush

The Council of Chief State School Officers (CCSSO) is a nationwide nonprofit organization of the 57 officials who administer departments of public education in U.S. states, territories, and the District of Columbia. Recognizing the responsibility of the states for leadership in education, the council exists to help its members and their agencies fulfill their responsibilities as leaders in education. To accomplish this, CCSSO provides service and a means of cooperative action among its members to strengthen education through the work of the state education agencies. The CCSSO seeks its members' consensus on major educational issues, and expresses these views to professional organizations, federal agencies, Congress, and the public. Employing a structure of standing and special committees, the council responds to a broad range of concerns about education and provides leadership on major issues.

CCSSO plans and conducts seminars and study programs that offer many opportunities for the professional growth and development of chief state school officers and their management teams. With offices in Washington, D.C., the council is able to express its members' views on major education issues to Congress and to the executive branch, including the U.S. Department of Education.

Special projects undertaken by council staff members address areas of concern at the state level and are designed to help state education agencies strengthen public education. Research and resources developed by council projects are widely disseminated to the states and territories.

Recognizing the importance of rapid and accurate communication between the Washington office and all of its members, William F. Pierce, the CCSSO executive director, began to investigate the feasibility of using electronic networking as a means of improving dissemination of appropriate information early in 1982. Dr. Pierce initiated a review and analysis of commercial providers of electronic mail and relevant data bases, and considered the ability of states in general, and chiefs in particular, to access these networks. Based on the results of that assessment, the CCSSO Board of Directors authorized the council staff to enter into an agreement with the National School Public Relations Association (NSPRA) to operate an electronic network as part of NSPRA's ED-LINE project, using The Source, beginning in December 1982. Arrangements were made for each chief and state board chair to have a subscription to ED-LINE with resulting access to the emerging system.

The council christened its new information and news service system Chieffile and began operation by offering electronic mail and a daily bulletin board containing information the council felt would be of interest to chief state school officers. ED-LINE added National Networks to its main menu (Exhibit A), and the Council of Chief State School Officers and the National Association of State Boards of Education to the submenu generated when National Networks is selected (Exhibit B). To ensure that every state had the opportunity to use the system appropriately, each CCSSO staff member was assigned a number of states to contact, offer assistance, and identify operational or procedural issues that might limit effective use of the system. This procedure—having each staff member monitor a block of states—was maintained for a period of one year, and proved to be most helpful in minimizing access problems and encouraging use of the network.

In addition to the news bulletin board (later reduced from daily to semiweekly), which came to be known as CHIEFLINE (Exhibit C), the council's information service has included the following components:

- Hill Notes: News concerning federal legislative issues updated weekly
- Clearinghouse on State Activities in Education: State profiles describing initiatives undertaken by the states to address the recommendations contained in *A Nation at Risk*
- Techfile: A file of information about technology-related activities in state departments of education
- Collaborative Ed: A data base listing school/college collaboration programs in the states
- Executive Fellows: A bulletin board designed to provide information to and encourage participation of state education agency staff selected for the Educational Resource Exchange Program
- Community Education Bulletin Board: An information system developed as part of a Mott Foundation grant to provide current and relevant information to state community education coordinators

This brief review of the files that have resided on the system reflects the changing nature of the chiefs' interests, the emerging issues, and the ability of the system to accommodate special project needs. As an example, the Clearinghouse on State Activities in Education reported information on specific activities undertaken by the states to respond to *A Nation at Risk*, and provided a valuable resource to administrators interested in looking at alternative approaches as they addressed their own needs.

Additionally, the maintainance of the system over time reflected new initiatives, beyond those suggested by the Excellence Commission, that continued and enhanced the education reform effort. The data files that described activities, programs, policies, and practices in areas of technology (Techfile) and school/college collaboration (Collaborative Ed), similarly provided decision makers with a reference base in developing or refining their own programs. Members have indicated that one of the most important services the council can offer is the dissemination of information about how their colleagues are grappling with common problems, and these information resources and the electronic system containing them effectively respond to this need. (It should be noted that recently, because of budget restrictions, several of the above-mentioned files have been discontinued on Chieffile. A current representative selection of Chieffile's information can be read in the exhibits that follow.)

A review of the use of Chieffile from December 1985 through August 1986 revealed that during the nine-month period, 46 states accessed the system. (CCSSO did not have a tracking system prior to December 1985, and changes to The Source operating system after August 1986 eliminated the tracking ability.) As the council has not yet successfully connected the extrastate jurisdictions (American Samoa, Northern Mariana Islands, Puerto Rico, Trust Territories of the Pacific Islands, and the Virgin Islands) or Hawaii on a cost-effective basis, this review indicates that only five of the remaining members did not access the system during that period. The council did not have the capability of tracking usage of the electronic mail facility during that time period; consequently, it is not known if the five members used that medium. Average monthly access of the system is depicted in the following chart.

State Usage of Chieffile

Average Monthly Access	Number of States
0	5
1–5	11
6–10	16
11–15	12
16–20	6

If a premise is accepted that access of the system by the states is spread evenly over the month, it can be assumed that 90 percent of the states check the content of Chieffile at least once a week, 68 percent access it twice a week, and 36 percent almost daily.

Although the council did not have the opportunity to account for the usage of the electronic mail capacity of the system accurately, there is evidence that members recognized and availed themselves of the benefits provided by this additional communication and information resource. This evidence was manifested in the form of frequent requests from constituents, sent to the council by electronic mail, to survey all the states concerning a matter of particular interest to a state. The requests received demonstrated the value of the system in helping decision makers address key issues on a timely basis. These requests responding to legislative inquiries or emerging policy issues and seeking information on what other states were doing or had completed included:

- Curriculum development in teaching about Acquired Immune Deficiency Syndrome (AIDS)
- Regulations and/or laws concerning teacher contract renewals
- Recent studies, briefs, and the like on state finance plans and equity
- Disclosure of student records
- Mandated duty-free lunch periods for teachers
- Outside employment policies for state and local staff
- Distance learning activities
- Number of pupil instruction days required and number beyond the minimum funded
- Procedures for evaluating managers and directors
- Graduation requirements and early exit arrangements
- Competency tests to permit students to move onto higher-level classes without taking prerequisite courses when proficiency has been demonstrated

- Actions taken in response to budget shortfalls
- State, district, and school planning requirements and master plan documents
- Policies for home instruction by parents
- Teacher supply-and-demand studies and procedures
- Policies concerning student fees
- School accountability programs

The use of the system by members to request information from their counterparts reached a sufficient volume that members asked the council to develop a procedure that would reduce requests for information already available and assist requestors in formulating inquiries that benefit multiple state needs. This unexpected development provided a management opportunity resulting from use of the new media. Specifically, the requests for information in all probability had not increased as a result of the new system, but for the first time requests were being received in a centralized location for handling or assignment to the appropriate location for response.

This opportunity to exercise control over the information dissemination process at both the state and council levels significantly increases awareness of what data is available, resulting in an increased potential for more effectively using information. It was gratifying to the council to see that traffic on the system was sufficient to justify the establishment of some controls to assure that its usage did not become intrusive and diminish its value to the chief state school officers and their management officials.
In June 1986, the council surveyed its membership concerning their views and suggestions on the content and use of the electronic system. Results of that survey indicated that the members were particularly interested in the following kinds of information:

- Executive Director's Analysis of Current and Timely Issues—96 percent of the respondents
- CCSSO Project Highlights—93 percent
- Focus on Issues and Briefings—84 percent
- CCSSO Committee Activities—84 percent
- Hightlights of Special Activities from Selected States—78 percent
- Demographic and Statistical Information Reflecting Emerging Trends—72 percent

The membership further approved the current schedule of updating the major bulletin boards on Tuesdays and Fridays of each week.

Based on the survey, the council is currently working with the Special Interest Group/State Education Agencies (SIG/SEA) of the American Education Research Association (AERA) to develop a computer conferencing capability that will solicit chief state school officers' input on current and emerging educational policy issues. Additionally, the council is seeking financial and technical support to develop an international education network electronically connecting the council with its counterpart organizations in Great Britain, Canada, Australia, Mexico, the Nordic countries, and Germany, and with the ministers of education in South America, Africa, the Middle East, and the Far East. The objectives of this international electronic network would include:

- Maintainance of regular communication between those individuals responsible for administering the educational enterprise in their respective jurisdictions
- Creation of a computer conferencing capability that would provide participating administrators the opportunity to exchange views and ideas, interactively, on topics of mutual interest
- Establishment and maintenance of appropriate data bases to describe the demographic and organizational characteristics of the education system in each participant's country
- Establishment of a computer-accessible data base on resources available to support a global awareness and understanding of the international dimensions of education
- Development of an international indicators report

In retrospect, some of the major considerations associated with the establishment and operation of the network included the following issues: What is the major purpose of the system and whom is it designed to serve? This question involved consideration of the content of the system, the operational style of those it was designed to serve, and access to the system by nonmembers. If the system were open to all members of the State Education Agency, would controls be required to ensure that its relevance for chief state school officers was not diminished? If the chief state school officers were likely to assign the responsibility of accessing the system to staff members, how could those persons be adequately trained in system operation? Similarly, if chiefs assigned staff members with particular program interest as the network liaisons (for example, legislative specialists) how could the council ensure that this specialized interest did not begin to dominate the system emphasis? Who would manage the network?

Collecting, editing, and reporting information of interest to a diverse membership is not a casual undertaking to be done on an ad hoc basis. Too many consecutive issues of a newsletter or bulletin board that are not valuable to the subscriber would be a death knell for the network. How could the system be most effectively evaluated and improved? What procedures needed to be established to accommodate those who missed information presented electronically? These questions took a great deal of research, analysis, and effort to work through as the council brought the system from the design to the operational stage. Many mistakes were made, but changes were initiated almost immediately. In spite of the problems and the effort required, the council is extremely pleased that Chieffile was established.

In summary, the council has found electronic networking to be an extremely effective communication medium, and participants feel that they have only begun to avail themselves of its full potential. The council is continuing to investigate the network's capacity to disseminate information on a timely basis, permit interchange of ideas, and maintain appropriate and accessible data bases.

Exhibit A: ED-LINE on The Source

(**Note:** To access Chieffile, first choose option 7, "National, State, Regional Networks.")

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**************************
*                        *
* Welcome to ED-LINE     *
*                        *
**************************

 ED-LINE MAIN MENU

  August 7, 1987

 1 Education USA Newsline <NEWS>
 2 School PR Line: The NSPRA Network <PR> (6-1-87)
 3 Federal Alert <ALERT> (8-3-87)
 4 EDTECH Update <EDTECH> (7-24-87)
 5 Legal Briefs: The Law of the Land (7-6-87) <LEGAL>
 6 RuraLine <RURAL> (7-23-87)
 7 National, State, Regional Networks <NETWORKS>
 8 Network Directory <DIRECTORY>
 9 Ed Exchange <EXCHANGE>
10 What's New in Research from U.S. Department of Education
   <RESEARCH>
11 ERIC Digests Online (Timely Education Reports)<ERIC> (7-15-87)
12 ED-LINE Bonus <BONUS> - AUGUST
13 School Improvement Tips (7-28-87) <TIPS>
14 Associated Press Wire Service <AP>
15 United Press International <UPI>
16 Sign Off from ED-LINE and The Source <OFF>

Enter item number, <Q>uit or <H>elp: 7
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Exhibit B: National, State, Regional Networks Menu

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(Note: Choose option 1 to access CCSSO's Chieffile.)

NATIONAL, STATE, REGIONAL NETWORKS

 1 Council of Chief State School Officers <CCSSO>
 2 Educational Resources Information Center <ERIC>
 3 National Assn. of Elementary School Principals <NAESP>
 4 National School Boards Assn. <NSBA>
 5 School Public Relations <NSPRA>
 6 Office of Educational Research and Improvement <OERI>
 7 Communication/Youth News Service <YOUTH>
 8 Kentucky Network for Educational Telecommunication <KNET>
 9 ORE-NET, Oregon's Education Computer Information Network
   <ORENET>
10 Washington State School Directors' Assn. <WSSDA>
11 WIS/NET Wisconsin Assn. of School Boards <WASB>
12 Wyoming Dept. of Education <WYNET>
13 Regional Educational Laboratories <REL>

Enter item number, <Q>uit or <H>elp: 1
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Exhibit C: Contents of Chieffile on August 7, 1987

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***************************************************************************
ChieFFile, the news and information service of the Council of Chief State
School Officers for August 7, 1987.
***************************************************************************

1 CHIEFLINE—CCSSO Newsletter for 8/4/87
2 Hill Notes—News from the Hill for 7/31/87
3 Community Education Bulletin Board August 5, 1987
4 Exit The Source

Enter item number, <Q>uit or <H>elp: 1

Screen 1 of 12
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CHIEFLINE

Tuesday August 4, 1987

UPDATE: MICHIGAN EXTENDS DATE FOR SUPERINTENDENT SEARCH

At its July 15, 1987, meeting, the Michigan Board of Education approved an extension in the date for applications and nominations for the position of State Superintendent of Public Instruction. The deadline date has been extended from July 31, 1987, to August 31, 1987. It is the hope of the State Board of Education that the extension of the deadline will permit as many interested and qualified candidates as possible to apply for the position. Letters of interest with a complete resume or nominations and inquiries should be sent to: Mrs. Cherry Jacobus, Secretary, Superintendent Search Committee, State Board of Education, P.O. Box 30008, Lansing, MI 48909, or call (517) 373-3900.

PENNSYLVANIA PRINCIPALS ATTEND ACADEMY ON INSTRUCTIONAL LEADERSHIP

July 27–31, 1987, thirty-five principals from all regions of Pennsylvania became students when they attended the first Principals Academy on Instructional Leadership at the Pennsylvania Department of Education. The week-long academy was designed to help principals strengthen their role as leaders in improving the effectiveness of teaching in their schools. According to Education Secretary Thomas K. Gilhool, "Especially important is instructional leadership that arms teachers with a command of systematic methods of teaching that can be adapted to the learning style of each child." The principals attending the academy were chosen from more than 100 who applied for the program earlier this month. At the academy, the principals will focus on four aspects of school leadership: overcoming obstacles to instructional leadership; leadership styles and strategies; principles and practices of effective instruction; and promoting teacher development.

In addition to attending an initial one-week session, the principals will attend weekend workshops in October and April to reinforce the original training and to discuss successes and problems encountered during the school year. Each participating principal also must work with a partner and a local team of principals during the school year to apply practices that have the greatest promise for improving student achievement. The second academy will take place August 11–14, 1987, and will serve an additional 35 principals. In late June, the Education Department issued invitations to 300 principals and their superintendents. For further information, contact Timothy Potts at (717) 783-9802.

OREGON BOARD OF EDUCATION APPROVES DROPOUT REPORTING SYSTEM

In late July, the Oregon Board of Education voted to require Oregon school districts to report names of students who drop out of school to the Oregon Department of Education. The reporting system will begin in the 1988–89 school year. On November 15, 1987, districts will report the names of students who did not return after summer vacation or dropped out during the first quarter of the school year. On July 31, 1988, districts will report the names of students who dropped out since the fall report. The rule defines dropouts as students who withdraw from school without receiving a high school diploma or an alternative award—a GED certificate, or an adult high school diploma from an Oregon community college. Students are not counted as dropouts when a request for transfer of records is received by the reporting district from another district within 45 days. The department will pilot test the system during the 1987–88 school year in a sampling of districts across the state. For further information, contact Les Adkins at (503) 378-5585.

ALASKA COMMISSIONER DEMMERT TO CHAIR CONSORTIUM

Alaska Commissioner of Education William G. Demmert will chair a consortium of the chief education officials from Circumpolar regions to explore future cooperation in delivering education to remote polar regions of the world. Demmert, an Alaska Native appointed to the state's top education post by Governor Steve Cowper and the State Board of Education, will host a meeting of the Circumpolar education officials in Juneau in May 1988 to explore methods for delivering "distance education" using educational technology. Demmert's election to the chair came during a meeting in late June on Baffin Island off the east coast of Canada's Northwest Territory. Also attending the meeting were Canadian ministers of education from the Northwest Territories, Yukon Territory, Newfoundland, and Labrador, and personal representatives of the ministers of education and culture for Greenland and Quebec.

The education leaders agreed to sign a memorandum of understanding to explore sharing educational program information, services, and research findings. They also agreed to coordinate development of education programs of common interest to avoid duplicative efforts. The leaders identified family life education and drug and alcohol education as examples. Finally, they agreed to write and distribute a joint publication outlining exemplary policies and programs, and to explore exchanges of staff and students from K–12 and postsecondary schools. For further information, contact Harry Gamble at (907) 465-2821.

STATE HIGHER EDUCATION LEADERS URGE NEW EFFORTS TO INCREASE MINORITY COLLEGE GRADUATES

Citing moral imperatives and economic necessity, Donald J. Nolan, Deputy Commissioner for Higher and Professional Education in the New York State Education Department, recently joined his fellow state higher education leaders in calling for an all-out effort to increase the college-going and graduation rates of minority students. This statement was made in conjunction with the release of a report by the Task Force of the State Higher Education Executive Officers (SHEEO), "A Difference of Degrees: State Initiatives to Improve Minority Student Achievement." The report concludes: "We simply can no longer content ourselves with progress for minorities that is episodic, grudging, and vulnerable to quick reversal at the slightest hint of benign indifference." For further information, contact Donald J. Nolan at (518) 474-5851.

Friday July 31, 1987

CCSSO STATE EDUCATION ASSESSMENT CENTER CONDUCTS TWO EDUCATION INDICATORS MEETINGS

July 23, 1987. The CCSSO State Assessment Center conducted a network meeting to review the Assessment Center's plans for reporting state-by-state indicators in education this fall. Plans discussed included descriptions and specifications of individual data elements tentatively planned for reporting. Participants commented on the technical quality of information reported, including its validity, accuracy, and consistency among states. Anne Hess, chair of CCSSO's technical advisory network, chaired the meeting.

July 24, 1987. The State Assessment Center conducted a second meeting to review preliminary plans for reports to be issued by the Assessment Center on state-by-state indicators on education. Plans discussed included the content and analytical models to be used in the reports; the audience, organization, style, and graphics to be used; and the standards, conditions, and qualifications to be applied in interpreting and using the data. Irene Bandy, chair of CCSSO's user/policy advisory network, chaired the meeting. Both all-day meetings were held at CCSSO's offices in Washington, D.C. For further information, contact Ramsay Selden at (202) 624-7700.

DEPARTMENT OF EDUCATION DRUG EDUCATION AND PREVENTION AUDIOVISUAL MATERIALS PROGRAM GRANT INFORMATION

The U.S. Department of Education is conducting a $4.5 million grants competition to produce and distribute high-quality videotapes about the hazards of drug use. These tapes should be appropriate for classroom viewing by millions of America's elementary and secondary school students. The objective is to steer young people away from drugs and show them how to lead healthy, productive lives. The $4.5 million will be used to fund up to 16 proposals, estimated to range from $200,000 to $1 million. Under this program, the Secretary may make an award to a state educational agency, a local educational agency, an institution of higher education, or another profit or nonprofit agency, organization, or institution. Deadline for Grant Applications is September 4, 1987.

For applications or information, contact Louie E. Mathis, Office of Public Affairs, U.S. Department of Education, 400 Maryland Ave. SW, Room 4317 Switzer Building, Washington, DC 20202, or call (202) 732-4637.

SENATE PASSES TRADE BILL

On Tuesday, July 21, 1987, the Senate concluded consideration of S. 1420, the Omnibus Trade and Competitiveness Act of 1987. Passing 71 to 27, the bill contains education provisions which are basically those contained in S. 406, the Education for a Competitive America Act approved by the Senate Labor and Human Resources Committee. The Senate bill must now be reconciled with H.R. 3, the House version of trade legislation. A conference is not expected until after the August recess. For further information, contact Carnie Hayes at (202) 393-8165. (Source: Hill Notes, July 24, 1987)

LOCAL SCHOOL REFORM INITIATIVES AT AFT QuEST CONFERENCE

American Federation of Teachers (AFT) is sponsoring its biennial Quality Education Standards in Teaching (QuEST) conference, which opened Monday, July 27, 1987, and runs through August 2, 1987, at the Washington, D.C., Hilton Hotel. The conference will investigate what programs AFT affiliates and others are using on the local level to redefine the teaching profession and better meet the needs of the nation's students. The theme for this year's conference, "The Challenge in Change: Vision, Leadership and Action," reflects the AFT's out-front role in education reform and its willingness to discuss what others will not. For further information, contact Ruth Whitman, Scott Treibitz, or Jan Usdan at (202) 879-4458 or 800-238-1133.

NATIONAL GOVERNORS' ASSOCIATION RELEASES FOLLOW-UP REPORT ON STATE EDUCATION INITIATIVES

According to a recently released report by the National Governors' Association (NGA), states continue to place a very high priority on education reform and on state education initiatives. The fifty-state survey found that efforts to improve teaching continue to dominate the state education agenda, but school leadership and management issues are beginning to receive increased attention as states initiate policies to link school rewards and sanctions to educational performance. The survey, RESULTS IN EDUCATION: 1987, is the first annual follow-up to the major education report, TIME FOR RESULTS: THE GOVERNORS' 1991 REPORT ON EDUCATION, released last year. In that report, gubernatorial task forces looked at seven of the most difficult issues facing education. These included teaching, leadership and management, parent involvement and choice, readiness for at-risk youth, educational technology, school facilities, and college quality.

The survey found that during the past year states paid growing attention to the needs of at-risk youth, as evidenced by early childhood education initiatives, and by programs to identify and provide remedial or alternative education programs for at-risk youth. Further, states have shown increased interest in addressing the quality of higher education by encouraging postsecondary institutions to define more clearly their missions and assess how well they accomplish them. The report suggests the following goals:

- Assuming larger responsibility for setting education goals and defining outcome standards

- Developing appropriate and effective sanctions for consistently poor performance by school districts

- Stimulating innovation and inventiveness at the local level, by local school boards, administrators, and teachers

- Removing state regulations which interfere with local efforts to restructure their schools

- Developing tests and other assessment tools which more appropriately reflect the educational outcomes we value

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RESULTS IN EDUCATION: 1987 is available for $12.50 per copy and TIME FOR RESULTS: THE GOVERNORS' 1991 REPORT ON EDUCATION is available for $12.95 per copy from the National Governors' Association Publications Office, 444 North Capitol St. NW, Washington, DC 20001-1572.

HILL NOTES

July 31, 1987

OFSR REESTABLISHES FLR BROWN BAG LUNCHES

The CCSSO-OFSR held an informal brown bag lunch with Washington-based FLRs on Monday, July 27. Information shared by those in attendance included Senate action on allocations to the appropriations subcommittees (see Hill Notes, July 24), and strategies for the upcoming conference on trade legislation. OFSR will convene these lunches periodically; the format will be informal with no set agenda. Put Monday, August 10, on your calendar for the next lunch, in CCSSO's conference room. We will try to keep the meetings to a maximum of one hour, from 12:00 to 1:00. All FLRs are welcome to attend.

FLR STEERING COMMITTEE MEETING

The FLR Steering Committee will be meeting in Washington, D.C., on Wednesday, August 12, from 10:00 a.m. to 3:00 p.m. in room 337 of the Hall of the States Building. An agenda will be included in the next Hill Notes.

APPROPRIATIONS

The House Appropriations Committee met Thursday, July 30, to mark up the appropriations bill for Education and Labor as reported by the Subcommittee. The bill, H.R. 3058, includes $20.6 billion for the Department of Education, an increase of $1.165 billion over FY 1987. A breakdown by programs is summarized below:

- Chapter 1—$4.595 billion is appropriated for compensatory education, a $650.8 million increase over FY 1987.

- Bilingual Education—$198.9 million is appropriated, restoring $30 million to the Emergency Immigrant Education Program.

- Education for the Handicapped—$1.913 billion is appropriated for handicapped programs, an increase of $172.9 million over FY 1987.

- Vocational and Adult Education—$1.029 is appropriated, a $41.9 increase over FY 1987.

- Math/Science—$55 million is appropriated, a $25 million decrease in allocations available for FY 1987.

- LEAD—Current level funding, or $7.177 million, was recommended for the Leadership in Educational Administration Development Act.

- Education Research and Statistics—$73.8 million is appropriated, an increase of $10.2 million over FY 1987.

A more comprehensive breakdown by programs will be sent to all FLRs in August. If you would like further information now, call Jana Lumley at (202) 393-8165.

ACTION ALERTThe House will be considering H.R. 3058 the week of August 3. Delegations should be contacted and urged to support the appropriations bill. You should include your priorities (e.g., math/science) when you contact your representatives. Don't forget to oppose any across-the-board cuts, as expected from the bipartisan task force that is attaching amendments to all appropriations bills (see Hill Notes, July 17, 1987).

The Senate Appropriations Committee has been unable to reach a compromise on 302B allocations (see Hill Notes, July 17 & 24). Negotiations are expected to continue this next week. All recommendations offered to date would require outlay cuts of various sizes to Labor-HHS-Education. Please continue to contact the committee members, urging their support for the Congressional commitment to education expressed in the FY 1988 budget resolution.

UPCOMING HEARINGS

The Senate Labor and Human Resources Subcommittee on Education, Arts and Humanities will hold a hearing on the reauthorization of the Adult Education Act, Thursday, August 6, at 10:00 a.m. in SD-430 Dirksen Building.

LETTER TO THE CONFEREES ON THE OMNIBUS TRADE BILL

A draft letter to the conferees on the trade bill was sent to all FLRs via electronic mail (check your mail!!). Please don't forget to contact the CCSSO-OFSR with your comments and suggestions on the letter. Call Jana Lumley at (202) 393-8165, or send your comments via electronic mail by FRIDAY, AUGUST 7.

THE BEST-LAID PLANS . . .

The general consensus on the most convenient day for receipt of ***HILL NOTES*** is Friday. WE are committed to this, but our WANG SYSTEM is not yet convinced. Thanks for your patience.

****HILL NOTES****

July 24, 1987

LEGISLATIVE COMMITTEE D.C. MEETING

The Legislative Committee of the council met in Washington on the morning of July 21, 1987. Members present were Thomas McNeel (WV, Chairman), Joseph E. Lutjeharms (NE), Wayne Sanstead (ND), and Robert Feir for Thomas Gilhool (PA). FLRs and/or Washington representatives from AL, CA, CT, FL, MD, NY, PA, VT, WA, and WV attended the meeting. CCSSO staff members Carnie Hayes, Jana Lumley, and Gail Smith were also present throughout the day.

The committee considered the CCSSO staff recommendation that the council express its support of the Civil Rights Restoration Act. Cindy Brown, director of CCSSO's Resource Center on Educational Equity, delivered a brief report on the history and ramifications of legislation that has been pending since the 99th Congress to restore the interpretation of the Civil Rights Act prior to the Supreme Court's Grove City ruling. After discussion, the committee moved to endorse the concept of restoring the protections afforded by the Civil Rights Act to all programs in institutions that are federally funded.

The Legislative Committee received a procedural recommendation that the CCSSO president appoint a special task force to develop recommendations for the reauthorization of the Carl D. Perkins Vocational Education Act in 1989. Discussion centered on the issue of timing (in light of the major elementary and secondary reauthorization and action on omnibus trade and other legislation) and representation (to ensure all council interests and concerns are considered in the development of the proposals). The chiefs concluded that convening such a task force would be appropriate and timely, and recommended that the president make the appointments as soon after the Summer Institute as possible. It was further decided that the task force should report its recommendations to the Legislative Committee for action by the full council at the 1988 Annual Meeting.

ACTION ALERT It was recommended that one member of the VOC-ED task force be nominated by the FLRs. If you would like to participate or recommend an FLR with relevant experience, please contact Jim Gladwell, chair of the FLR Steering Committee, at (304) 348-2441.

The committee also considered the FLR recommendation that members of the Legislative Committee be permitted to serve on a second CCSSO committee. Discussion focused on the need to generate interest in serving on the Legislative Committee, its differences from other CCSSO committees, and the time and resource demands on chiefs in serving on council committees. The consensus of the committee members was that the chiefs are already overextended, and it would be difficult for a chief to effectively participate in the meetings and activities of more than one committee. Based on discussion of how to enhance attendance and strengthen the decision-making process on legislative matters, the committee recommended that the council consider these issues in the context of the CCSSO committee structure, and that the executive director, the OFSR, and the FLRs should collaboratively develop recommendations for its structure and responsibilities.

Carnie Hayes summarized current Congressional activity on reauthorization of elementary and secondary programs, omnibus trade legislation, and the budget and appropriations process, as well as related CCSSO activities in these matters. FLRs will be sent copies of the written legislative update that was included in the committee's materials.

The Legislative Committee heard a panel discussion between Marianne Luciano (VT-FLR) and Alistair MacKinnon (NY-FLR) regarding the issue of the small state minimum in the spectrum of policies and positions on Chapter 1. Discussion included the question of whether it is appropriate for CCSSO to have positions on formula-related issues, the role of CCSSO in providing contexts where states can work out their differences on issues like this, and the potential advantages of reaching broad and specific legislative consensus on issues of this nature versus the potential for misunderstandings among the states and CCSSO and the Hill. The committee concluded that states should be kept informed on the issue of small state minimum and that the states, through FLRs, should continue to discuss the matter and work toward consensus.

FLR STEERING COMMITTEE D.C. MEETING

The FLRs met immediately following a joint lunch with the Legislative Committee. Present for all or part of the meeting were Jim Gladwell (WV, Chairman), Mary Beth Jorgensen (MD), Gail ImObersteg (CA), Mary Ann Luciano (VT), Pat McGinnis (CA), Scott Brohinsky (CT), Al MacKinnon (NY), Maura Gavin (PA), Robin Vink (NY), Eileen Wiegert (WA), Jim Pirius (FL), and Bill Mellown (AL).

The Steering Committee set their next meeting for August 12 in Washington, D.C. The meeting will begin at 9:00 a.m. in the Hall of the States (room to be announced later). The agenda will include (1) work on the FLR recommendations for procedures and strategies for addressing various legislative situations through the mutual roles and responsibilities of the Legislative Committee, CCSSO staff, and FLRs and (2) discussion and designation of FLR representative for the Special Task Force on voc ed reauthorization (see item on Legislative Committee meeting above; call Jim Gladwell at (304) 341-2441 if interested in serving as the FLR rep or nominating someone).

In response to a memo to the Steering Committee from Gordon Ambach, CCSSO executive director, the FLRs concluded discussion and reworking of Recommendation A, the statement of FLR role and responsibilities. Following is the text as it is recommended for the CCSSO brochure and handbook:

> The Federal Liaison Representatives (FLRs) are individuals appointed by each Chief State School Officer to represent the interests of the chief on all federal education issues. Some chiefs may choose to be FLRs. FLRs are responsible for advocacy and support of elementary/secondary education programs, currently receiving billions of dollars. The FLRs work cooperatively with CCSSO to ensure maximum benefits for education and the state education agencies as laws, policies, or regulations are developed by various branches of the federal government.

> Federal Liaison Representatives meet quarterly. A steering committee is elected to provide oversight of ongoing federal concerns, and to coordinate legislative activities on behalf of the state education agencies. Other activities conducted by the FLRs include professional development, data collection, and communication among state agencies, members of Congress, congressional staff, and other national educational organizations.

Also in response to the memo, the committee agreed to develop a policy paper describing FLR roles and functions in relation to the council and staff, elaborating how their responsibilities and interactions play out in different stages of the legislative process. (A hard copy of the memo will be sent to each FLR.) A draft paper will be developed by Mary Beth Jorgensen (MD) before the August 12 meeting. Any insights or suggestions should be referred to her at (301) 333-2208.

National survey data gathered by the Chapter 1 coordinators was distributed to the steering committee. The steering committee is analyzing the data and making recommendations on its content, format, and presentation to the Chapter 1 coordinators.

Carnie Hayes reported on CCSSO's work with the child advocacy groups on legislative recommendations for Chapter 1, including program improvement, parental involvement, and targeting. The NAACP Legal Defense Fund is interested in having SEAs analyze the impact on the states of a within-state 2 percent absorption factor in the allocation. The Administration has provided a state-by-state computer simulation on the effects of the two targeting mechanisms from county to county, and a copy was given to each FLR. FLRs not present at the meeting will receive the simulation for their state in the mail for the CCSSO-OFSR.

The steering committee concluded business by meeting with Ramsay Selden, CCSSO's director of the State Education Assessment Center, to offer suggestions on the design of a survey to the SEAs on their federal share of administrative costs. It was decided that FLRs should be used as the contact point to enhance the prospects for gathering accurate and usable data.

LEGISLATIVE UPDATES

APPROPRIATIONS

There has been no further action on House education appropriations. Please continue contacting your delegations regarding the ad hoc task force that has committed to applying across-the-board cuts to all appropriations bills on the floor. Full committee mark-up is scheduled for July 29 & 30. For background, see Hill Notes, July 17, 1987.

On Tuesday, Senator John Stennis (D-MS), chairman of the Committee on Appropriations, convened his subcommittee chairs to receive their requests for total appropriations to their subcommittees. Eleven of the chairmen made requests in excess of those allocated in the budget for their functions; exceptions were Labor-HHS and Education, and HUD and Independent agencies. Naturally, the aggregate was higher than the total allowed by the budget resolution. Suggested solutions included a 1 percent across-the-board cut to all subcommittee requests. This amounted to a disproportionate cut to Labor-HHS, and specifically to education. Deliberations by the chair and his subcommittee chairs are expected Wednesday, July 29.

****ACTION ALERT**** Members of your delegation should be contacted and urged to maintain the commitment to education expressed by the Senate in the budget. Opposition to the redistribution of appropriations from education programs to other programmatic areas should be expressed. The Committee for Education Funding (CEF) and each of the individual association members will be delivering letters to this effect to the Senate on Monday, July 27. For further information contact Carnie Hayes at (202) 393-8165.

At present, the Senate is considering H.J. Res. 324, the Debt Ceiling Extension Bill. Some budget reform amendments are expected to be offered. For projected effects of budget reform initiatives see Hill Notes, July 17, 1987.

SENATE PASSES TRADE BILL

On Tuesday, July 21, the Senate concluded consideration of S. 1420, the Omnibus Trade and Competitiveness Act of 1987. Passing 71 to 27, the bill contains education provisions that are basically those contained in S. 406, the Education for a Competitive America Act approved by the Senate Labor and Human Resources Committee. The Senate bill must now be reconciled with H.R. 3, the House version of trade legislation. A conference is not expected until after the August recess.

UPCOMING HEARINGS

The Education, Arts and Humanities Subcommittee of the Senate Labor and Human Resources Committee will hold a hearing on legislation to provide grants to assist local school districts in implementing voluntary desegregation plans—10:00 a.m., 430 Dirksen Senate Office Building, Thursday, July 30.

The House Select Education Subcommittee of the Education and Labor Committee will hold an oversight hearing on the Office of Educational Research and Improvement—9:30 a.m., 2257 Rayburn House Office Building, Thursday, July 30.

COMMUNITY EDUCATION BULLETIN BOARD AUGUST 5, 1987

Community Education Bulletin Board is the weekly newsletter of the Council of Chief State School Officers (CCSSO) Community Education Project, funded by the Charles Stewart Mott Foundation. The bulletin board is designed to provide information about community education to participants.

DEPARTMENT OF EDUCATION DRUG EDUCATION AND PREVENTION AUDIOVISUAL MATERIALS PROGRAM GRANT INFORMATION

The U.S. Department of Education is conducting a $4.5 million grants competition to produce and distribute high-quality videotapes about the hazards of drug use. These tapes should be appropriate for classroom viewing by millions of America's elementary and secondary school students. The objective is to steer young people away from drugs and show them how to lead healthy, productive lives. The $4.5 million will be used to fund up to 16 proposals, estimated to range from $200,000 to $1 million. Under this program, the Secretary may make an award to a state educational agency, local educational agency, institution of higher education, or another profit or nonprofit agency, organization, or institution. Deadline for Grant Applications is September 4, 1987.

For applications or information contact: Louie E. Mathis, Office of Public Affairs, U.S. Dept. of Education, 400 Maryland Ave. SW, Room 4317 Switzer Building, Washington, DC 20202, or call (202) 732-4637.

NEW RURAL EDUCATION REPORT ASSESSES CONDITION OF RURAL SCHOOLS

Educators and local school board presidents in rural America have some real concerns about how well their schools are doing. One is the need to improve the academic performance of students from low-income families. The other is the challenge of providing students with critical thinking and reasoning skills. These and other facts emerge from a national survey of nearly 9,300 school board presidents, district superintendents, building principals, and classroom teachers from rural America. The survey reveals that at least half of the respondents believe something should be done to improve the academic performance of students from low-income families (60 percent) and students' thinking and reasoning skills (60 percent). The need to find a better way of recognizing and rewarding teachers comes in third (48 percent). Those people closest to the classroom express the most dismay about the overall quality of rural, small schools. Teachers and principals tend to mirror each other's concerns. District superintendents, on the other hand, tend to see more good than bad when looking at their schools. School board presidents are even more rosy-eyed in their assessments.

Teachers and principals tend to see more wrong with their schools than do either the superintendents or school board presidents. School board presidents, judging from the survey, are rural, small schools' biggest boosters. They think about half of the items on the survey need some attention, but only a handful really require some immediate consideration. At the same time, the board members think at least a third of the survey issues are really nonissues in their communities. Copies of the report, Building on Excellence: Regional Priorities for the Improvement of Rural, Small Schools, are available from CEDaR, Suite 305, 1201 16th Street NW, Washington, DC 20036 for $6, prepaid. (Source: R & D Preview, "Proud But Concerned," p. 2, by Joe Schneider.)

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MINNESOTA ADULT LITERACY CAMPAIGN

In August 1986, a meeting was convened in Washington, D.C. to gather representatives of fifteen states which had organized a statewide, coordinated literacy initiative. Participants at that meeting indicated an interest in some form of ongoing information sharing among themselves and with other organizations and individuals interested in statewide literacy initiatives. Much has changed in the literacy landscape since last August. Many more states have developed or are in the process of developing coordinated statewide literacy initiatives. Governors are increasingly becoming aware of the relationship that literacy has to economic development and welfare reform. The National Governors Association and the Council of State Planning Agencies will soon release a literacy report and policy guide for governors.

To give input and receive information from the Minnesota Adult Literacy Campaign, contact Jean Mannink, Minnesota Adult Literacy Campaign, 475 North Cleveland Avenue, Suite 210, St. Paul, MN 55104, (612) 644-9978.

MAKE ROOM ON YOUR CALENDAR: IT'S CONFERENCE TIME

MAPP2 IN NOVEMBER: The Indianapolis Public Schools and the Indiana Department of Education are cosponsoring a national conference on parent involvement in Indianapolis on November 15, 16, 17, and 18, 1987. This second Methods for Achieving Parent Partnerships Conference, "Maintaining Active Parent Partnerships," will include nationally prominent speakers and will be directed toward policy makers, teacher trainers, teachers, school administrators, parents, and parent organizations. This conference will be held at the Holiday Inn Historic Union Station. For further information contact Project MAPP2, Indianapolis Public Schools, 901 N. Carrollton, Room #208, Indianapolis, IN 46202, (317) 266-4134.

NATIONAL CONFERENCE ON CIVIC RENEWAL IN NOVEMBER: This conference is designed to identify ways to improve the quality of civic life in American communities. Jointly sponsored by the National Civic League and the Lincoln Filene Center for Citizenship and Public Affairs, the conference will be held November 15–17, 1987, at the Sheraton Boston Hotel, Boston, Mass. For leaders interested in improving community life, the conference seeks three outcomes: A Civic Index—characteristics that define the qualities of civic health for communities; A Civic Policy Agenda—recommendations at all levels to encourage civic renewal; A Civic Renewal Action Plan—an organizational plan to develop resources and activities to support civic improvement in American communities. For further information, contact The National Conference on Civic Renewal, Civic Education Foundation, Lincoln Filene Center, Tufts University, Medford, MA 02155.

NATIONAL COMMUNITY EDUCATION ASSOCIATION: Minnesota and surrounding states will host the 1987 NCEA Conference. National issues such as leadership, learners at risk, community education programs and process, and others are being highlighted in the conference program which will be held at the Hyatt Regency Hotel in Minneapolis, Minn., December 3–5, 1987. For further information contact NCEA, 119 N. Payne St., Alexandria, VA 22314, (703) 683-6232.

NEW RESOURCES

NCEA'S NEW WORKBOOK FOR COUNCILS: So You're on the Council is a workbook for each member of a community council. It comes with a Facilitator's Guide, which shows the group leader how to conduct the first three meetings of the year and is designed to produce an action plan for the council to follow. For further information on obtaining both of these publications call (703) 683-NCEA.

The U.S. Public Health Service has a toll-free hotline to answer questions about AIDS. Recorded information is available 24 hours a day, seven days a week. In the continental U.S., call 800-342-AIDS. In Alaska and Hawaii, call collect (202) 245-6867.

NATIONAL EDUCATION INDICATORS DEMONSTRATE SCHOOL PROGRESS

With the release of the latest Condition of Education report by the Department of Education there is an answer to the question, "Is there any way to measure local progress against national trends?" The original goal was the development of a set of education indicators paralleling the economic indicators so useful in tracking the economy. The following are selected highlights from the report:

- Between 1982–83 and 1985–86 school years, expenditures per pupil increased by 24 percent in current dollars and by 12.3 percent in constant dollars for average annual increases of 7.5 and about 4 percent, respectively.
- The supply of new teacher graduates is expected to decrease from 1986 into the early 1990s, portraying a moderate decline in numbers over recent years.
- Students from homes with many reading materials and who watched little television read much better than students from homes with few reading materials and who watched a great deal of television.
- Cocaine use among high school seniors had more than tripled since 1975. In 1985, almost one out of every 15 high school seniors reported using cocaine in the past month.
- While alcohol usage has declined slightly over the decades, rates remain high. Nearly 2 in every 3 seniors reported using alcohol in the month preceding the survey.
- At the elementary level, the ratio of pupils to teachers has dropped from 28.7 in 1959–60 to an estimated 20.4 in 1984–85.
- At the secondary level, the ration of pupils to teachers has fallen from 21.5 in 1959–60 to an estimated 15.7 in 1984–85.

The 1986 edition (published in Feb. 1987) of the Condition of Education report may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, order #065-000-00276-1 for $13.00. (Source: NSPRA Impact, vol. 3, no. 1, p. 5, by John H. Wherry, Executive Director of the National School Public Relations Association (NSPRA).)

BENNETT NAMES LITERACY INITIATIVE DIRECTOR AS HEAD OF ADULT EDUCATION

Education Secretary William Bennett recently named Karl Haigler director of the Education Department's Division of Adult Education. Haigler has been acting director of adult education since last September and has served as director of President Reagan's Adult Literacy Initiative—a post he will retain—since September 1985. Haigler will coordinate the efforts of the literacy initiative with the Education Department's adult education state grant program to promote collaboration between state and federal agencies and to encourage cooperation between public and private sector literacy providers and expansion of services for adult illiterates. The state grant program is funded at nearly $106 million this year, and the Education Department has requested a 22 percent increase for fiscal 1988. (Source: Education Daily, vol. 20, no. 115, p. 6)

PUBLIC EDUCATION ASSOCIATION'S COMMUNITY INVOLVEMENT IMPROVES SCHOOLS

To demonstrate how active cooperation between community and school can improve a failing school, Public Education Association (PEA) negotiated the collaboration of parents and staff of Brooklyn P.S. 152, Brooklyn College, and the district superintendent. PEA held a four-day workshop in which the collaborators worked out strategies for tackling such problems as student self-discipline, language acquisition for the high population of non-English-speaking parents and students; orientation of new immigrants; and involvement of parents in their children's learning. Virtually next door neighbors, P.S. 152 and the teacher training component of Brooklyn College were isolated from each other until PEA brought them together. The most important potential of this partnership is a staff better prepared to deal with problems in a poorly performing inner city public school. This project was undertaken through grants from the Henry and Lucy Moses Fund and the Lavanburg Corner House.

PEA trained candidates and educated the electorate for the May 6, 1986, Community School Board elections. With the United Parents Associations, PEA cochaired the City Wide Community School Board Elections Committee, which includes unions, parents, civic associations, the Board of Education, and the Board of Elections. The committee held training sessions for the candidates, each of whom was given free copies of PEA's two-part instructional Manual for Candidates. Working in the belief that a first step toward better public schools is improving community school boards, PEA led efforts to inform the public about the elections and the issues. The result was expanded coverage in the neighborhood and metropolitan press. In June PEA testified on problems and needed reforms before the New York State Assembly's Education Committee hearing on the elections. For further information about PEA, contact Executive Director Jeanne Silver Frankl, 39 W. 32nd St., New York, NY, (212) 868-1640.

NEW RESOURCES

School-Community Relations in Transition, by Richard W. Saxe, 361 pages, $23 hardbound. This book focuses on developing and maintaining the confidence of the public—a necessary requirement for effective educational systems in a democracy—by helping readers understand the condition of school-community relations. Furthermore, the book identifies and explains creative responses and initiatives appropriate for this time of transition. According to Richard Saxe, recent writings about school-community relations contain little guidance for concerned educators. Moreover, until recently, most preparation programs for teachers and administrators placed little emphasis on the relations between schools and parents and communities. This book will help school personnel assess and understand their new environments and identify resources to assist them in their efforts. To obtain this book write to McCutchan Publishing Corporation, 2526 Martin Luther King Jr. Way, Berkeley, CA 94704.

AIDS: The Disease and What We Know. A filmstrip for the senior high school level, from Sunburst Communications, Room TP 757, 39 Washington Ave., Pleasantville, NY 10570. Purchase price is $79.

AIDS: Facts and Fears, Crisis and Controversy. This videocassette program is designed to increase awareness about AIDS by presenting the facts about its symptoms, transmission, and treatment, and alert the public to practical methods of protection against the contraction of AIDS. Current medical research into the disease is also introduced along with medical experts' predictions for progress toward a cure. Another aspect of this program deals with developing an understanding for the plight of AIDS victims as they interact with a largely underinformed and wary public. Vendor: Guidance Associates, Box 3000, Mount Kisco, NY 10549, 800-431-1242. Purchase price is $189. (Both AIDS resources from NSPRA Impact, vol. 3, no. 1)

George Rush

George Rush was a staff member of the Council of Chief State School Officers for ten years. During that time he directed the State Technology Leadership and the CCSSO/NCES Network Coordination projects. Before joining the council in 1977, he served for ten years in various capacities for the Kentucky Department of Education, including seven years as director of computer services. He has also been a classroom teacher in Ohio and Kentucky.

MIX

The McGraw-Hill Information Exchange

Stephen M. Laliberte

Introduction

MIX is an on-line electronic publishing service and information exchange from the Educational Management Services Division of McGraw-Hill. It offers up-to-the-minute information for education and media professionals and technology coordinators.

Through computer conferencing and electronic mail, MIX provides quick access to a network of people across the country who are seeking ways to put computers to use to improve the quality of education.

What MIX Does

MIX is an information utility that quickly retrieves and stores facts and ideas compiled from a variety of sources—media and technology coordinators; science, business, math, and social studies teachers; educational associations; and McGraw-Hill itself.

The information is available through computer conferences and electronic mail. A computer conference is similar to a regular conference, but it is more convenient. Papers and commentary are put on-line and can be downloaded from the system for review by subscribers. Comments can be entered into the conference either directly or by uploading into the system.

Electronic mail is similar to regular mail, except that you don't need a stamp. Just enter the message into the system, addressed to the recipient. When your correspondent comes on-line, he or she is informed of the message. You are informed when he or she receives it.

Education.Tech

Education.Tech is a group of on-line conferences serving the needs of technology, computer, and media educators. There are ongoing informational conferences about instructional and administrative software, computer hardware and peripherals, video, telecommunications, curriculum development, and more.

Student Information Exchange

Although students are not permitted on-line, those students from schools that subscribe to MIX can share information through their teachers. They can exchange electronic mail and participate in student-oriented conferences by having a teacher upload messages from a disk and download incoming messages.

MIX lets teachers make available to students an exciting medium for the exchange of ideas and information, and it helps students understand what "global awareness" is all about.

How MIX Began

At its inception, the McGraw-Hill Information Exchange began with a minicomputer, software that provided computer conferencing and electronic mail, access to a worldwide telecommunications network, and a research budget. The first computer conferencing and electronic mail service, the Educational Management Service Information Exchange (EMSIE), began in a limited test area to define the needs of the market.

As a result of the EMSIE pilot, some educational needs were defined: the need to serve the teacher professionally not only by providing information but by providing access to other educators and experts in all disciplines; the need to provide telecommunications activities that involve students in communication activities that bring the real world into the curriculum; and the need to offer unlimited use of the service for a fixed annual fee so the expense could be budgeted and thus approved by the administration.

The Future of MIX

EMSIE evolved to MIX, the McGraw-Hill Information Exchange. MIX, which will be available worldwide in the 1987–88 school year, has been selected as host for the National Business Education Association (NBEA) network and the International Technology Education Association (ITEA) network. The Minnesota Department of Education has selected MIX as its official network, and the state is funding toll-free telephone lines so all Minnesota educators will have equal access to the service.

The 1987–88 school year will be very exciting. McGraw-Hill News, an up-to-the-minute news service that we will archive for on-line research projects, will be added to MIX. A schedule of curriculum enhancement activities for language arts, math, science, and social studies has been added. The education technology service has been expanded to include a daily news service published by *Byte* magazine that covers new developments in microcomputers; a telecommunications forum; and a technical support conference for the Apple II and Macintosh computers and the AppleWorks software program.

The pages that follow contain a copy of *The Online Educator*, the monthly newsletter provided with each MIX subscription. The newsletter describes information services published on MIX, as well as some of the activities that take place on these services and how educators are using them.

The Online Educator

News from MIX• The McGraw-Hill Information Exchange for Educators • Vol 2 No 1 • September 1987

The extended classroom: An invitation to the world

By Bill Hay

Any letters from California today?
Did the seniors from Minnesota reply?
Did Toshi from Japan reply to the letter I sent him yesterday?
I need background news articles on acid rain. May I get them after school?
Can I get some information on Gorbachev for my next class?

... a few of the questions that greet me everyday since I gave the world instant access to my classroom through a modem and several telecommunications networks.

Last November, two other teachers and I set goals for out extended classroom using telecommunications:

- Electronically publish as much student work as possible
- Give students the skills to access electronic information
- Use telecommunications as a tool to integrate subject areas

In my pre-modem classroom, almost 100 percent of a student's work was shared only with the teacher, then thrown away. After we published student work in computer conferences we found that the quality and quantity of the work, as well as students' excitement and enthusiasm, increased.

In the *creative writing/rewriting* conference, we extended the classroom process of editing by having students send their rough drafts of creative writing to the other school to be edited. The result was a more refined editing process since the student could not ask clarification questions of the author.

Are you concerned about the possibility of nuclear war? If you could ask Abe Lincoln a question, what would it be? The student responses to these and other thought provoking questions were posted in the various conferences. Themes varied from peace issues, to the confederation of Canada, to drug use and abuse, to books-I-have-read. Most students appreciated expressing their views to the extended classroom.

"How old are you?" is the first question most students asked each other in the penpal conferences they participated in. Knowing a penpal's age seems to make a difference in the online penpal exchange although the advantage of having an electronic penpal is that there is no need to know each other's age or sex.

In one penpal exchange, between students in grades 8-10 from our school and those in grades 10-12 in another school, we had students guess each others' ages after two or three exchanges. Several students found this

(continued on bottom of page 4)

California's tech funding slashed

California Republican Gov. George Deukmejian sliced the state's $26 million budget for educational technology in half and eliminated the $12 million budget of the state's 17 Teacher Education and Computer Centers (TECCs) during the first week of July.

A letter writing campaign by TECC employees and other educators ensued.

At press time:

- An amended Senate bill that called for full restoration of TECC funding failed in the Assembly Ways and Means Committee. The TECC issue was amended out in a compromise that would add $800,000 to the Educational Technology budget if the full assembly and governor approve it.

- The halving of the state's entire educational technology budget means that funds for a statewide telecommunications project must be cut

(FUNDS continued on page 4)

A Letter from the Publisher...

Our plans for MIX during the 1987-88 school year are driven by our desire to provide information and activities that help you use computers to meet instructional needs. So here is what we are planning this year:

- EMSIE has become MIX-The McGraw-Hill Information Exchange. By giving us their name, McGraw-Hill Inc. is articulating their commitment to the network.
- MIX is easier to use now that we've added menus to it. You can still use commands but menus let you do things like collect all your mail and conference messages and ship them to your PC, with one easy keystroke.
- We have diskettes that simulate MIX offline. You can use this simulator to learn the system before you even dial the phone.
- We have increased our activities and projects, invited more guest experts and a few celebrities, and added moderators. See page 6 for a project schedule.
- You will find an up-to-the-minute financial news service called the McGraw-Hill World News which has access to McGraw-Hill's 37 magazines, has a world-wide network of reporters and uses six news services to gather up-to-the-minute financial information.
- Our goal is to provide software and data libraries in 1988 to let you do things like send and receive files for any microcomputer, and get databases in the appropriate format.
- Another 1988 goal will be to set up PRE MIX , a telecommunications program for the Apple II, IBM PC and compatibles that will make life much easier for you. PRE MIX will have an automatic log-in feature, automatic download feature, a built-in word processor for writing messages offline and the ability to download program and data files.

We have an exciting year planned. We believe that telecommunicatons is the next wave in improving the process of educating our children.

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EDITORIAL

A sense of community

" Being a moderator...means being part of a team that is at the heart of planning, designing, and implementing the overall function of the entire network."

"Dad, what's MIX"

How do you explain what an electronic community is to your children? I show them the equipment: an air conditioned room housing the sleek minicomputer, with huge disk drives, speedy line printers, a "modem pool" on a rack, rows of terminals, backup storage tapes and cables everywhere. It's a Star Wars type of room - impressive to kids, intimidating to most adults, and fascinating to those who are more curious than uncomfortable with their lack of knowledge.

The Online Educator

Publisher
Stephen Laliberte
Editor
Griff Wigley
Assistant Editor
Amy Pampusch
Conference Moderators
Kitty Carton
Ardyce Ehrlich
Ken Evans
Paul Giganti
Jon Gordon
Mark Guzdial
Willian Hay
Jeff Holte
Peter Hutcher
Al Lundquist
Paul Musegades
Steven Pinney
Lynne Schrum
Linda Vaughn
George Willcox
Joan Winsor

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EMS/McGraw-Hill
9855 West 78th Street
Eden Prairie, MN 55344
Phone: (800) 622-6310
In MN: (612) 829-8200
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I explain that there's lots of information stored inside, many hundreds of pages of information on many different subjects. I suddenly realize how boring that sounds. All that fancy, space age hardware just to store piles of information? Describing an electronic communications network in terms of its technology and information is like describing a town in terms of its buildings, streets, location, climate and demographics. Just the facts, Ma'm.

Instead, I explain that MIX is an electronic community, much like our town of Northfield in southeastern Minnesota. A community doesn't just "sit there," it is alive - a living, breathing organism that depends on various parts cooperating and contributing. I stop short of a full blown social studies course and show them what it's like to sign on, but I carry the analogy further in my own mind.

Part of what makes any community thrive is the willingness of a certain number of people to assume leadership roles in areas beyond their normal jobs.

School boards, city councils, planning commissions, park boards, PTAs, volunteer fire and rescue squads, sports associations, arts guilds, church boards and civic celebration committees are all made up of citizens who have stepped forward and indicated a willingness and interest in contributing to the community. MIX has come to life through the same kind of community leadership spirit, only here we call them moderators.

All our moderators are full time educators, either classroom teachers, computer coordinators, or a combination of the two. They have come to be moderators in much the same way someone gets involved in a community: some saw a need and stepped forward; others demonstrated their knowledge or a particular skill and willingly agreed to help out when asked.

Being a moderator on MIX involves more than being responsible for a particular conference. It means being part of a team that is at the heart of planning, designing and implementing the overall functioning of the entire network. The *moderators* conference is where most of this activity takes place. We brainstorm, argue, problem-solve, teach, critique, support, weep and celebrate, much like any other team of colleagues that works closely together to accomplish a mutual goal. As leader of this diverse and talented group, I struggle to keep up with the discussion of issues, the endless stream of ideas, the enthusiasm for creating an excellent service that will truly make a difference for education.

While we use the very technology that we sell, we have come to realize lately that there is a need to use the phone occasionally (GASP!) and even ...get together face to face (HORRORS!) All the moderators met at our offices in Minnesota for a weekend "blowout" June 12-14. Our main task was to plan the entire 1987-88 school year's activities on MIX, from classroom telecommunications activities to guest experts for teachers. This "schedule of network programming for the new season," to use the jargon of the television industry, can be found on pages 6-8 and will be produced and directed by your dedicated crew of electronic community planners and leaders: the moderators.

Stay tuned.

Griff Wigley
MIX Editor

Before he was MIX editor, Griff Wigley was a computer coordinator and social worker in the Faribault, MN public schools.

Personality and the faceless medium

Online Observer

By Joan Winsor

Online relationships - the intimate stranger

(Editors note: The Online Observer is a monthly feature of TOE and MIX. Pertinent comments to the online version follow the article.)

After ten months of navigating online, I continue to be amazed at how well I feel I know people "there" that I've never even seen. Some of them have even become important to me on a personal level without the ordinary sensory input (sight, hearing, etc.) that usually goes into our "knowledge" of another person.

To begin with, there is the whole idea of where "there" is. Both children and adults are perplexed by the concept of a "place" without the conventions of geography.

I have been acting as go-between for 3rd and 4th-grade hearing-impared children in California who have been writing to hearing students in Minnesota.

After watching the "action" on the screen, and seeing their letters transmitted to the *student* conference, they wanted to know where the mailbox was that the kids in Minnesota would go to find their letters. This was made a *little* more clear in about a week when they found the replies on the screen.

The big bulletin board in the hallway outside their classroom door now proclaims: WE MADE NEW FRIENDS IN MINNESOTA! Printouts of their correspondence and replies are proudly displayed.

In discussing this subject with Gerri Sinclair, whose work as as educational technology consultant has given her considerable opportunity to experience these new "worlds," we found a shared difficulty in explaining to people exactly what it is like when we "go" to MIX or some other online world. Gerri said:

I had an interesting conversation this morning with an old friend about "going to MIX" or "going to Tokyo," and she said "you mean you really 'go' to your computer terminal don't you - or do you mean that you are having some sort of out-of-body experience?" I tried to tell her that it was not exactly an OBE, but there was a distinct sense of being somewhere else— and that the terrain was a shared space peopled by friends, acquaintances, and even strangers. She scratched her head, and said that she found it difficult to understand what I was talking about.

An out-of-body experience comes closer to describing it than a lot of other metaphors. Since the body is left behind, so are the stereotypes that go along with it. Without any idea of the appearance, accent, social status, or possibly even the sex of a person who is "speaking" online, what he or she says HAS to be taken at face value. It gives one access to the ideas without being distracted by the "packaging." Given comparable writing skills, people from all backgrounds, lifestyles, and physical conditions are essentially equal here.

Gerri offered an interesting example of this unique form of equity:

"I remember last summer being in a hotel with a friend I had met online...waiting to meet another mutual online friend that neither of us had met face to face. This guy turned out to be a teenager in full 'punk' regalia, with a purple spiked 'mohawk' hairstyle..."

When I mentioned my surprise at the strength of online relationships, in spite of the missing sensory input, Gerri talked about the phenomena of being able to pick online friends,who you've never seen, out of the crowd.

"As soon as we saw him walking down the street (among several other passers-by), we both turned to each other simultaneously and said — well there's X....," Gerri says of her "punk" friend.

Kitty Carton and I recently experienced this. During our recent spring break we met for the first time "face to face" in the airport and found that whatever it is besides "mere text" that gets passed along online is something very real - and, yes, even magical!

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observer/5.may #2, from mham

Packaging still applies to conferencing, only the wrapper is different. That may lead to our hearing from different people in an electronic conference than we would hear from in a conventional conference.

Someone who cannot type or cannot spell is apt to be "silent" in the electronic medium, but might be a well-regarded contributor in a face-to-face conference, where typing and spelling skills are beside the point.

Mike Ham

==========================

observer/5.may #8, from lvaughn

Mike,
Your thoughts are interesting. As a Business Ed teacher, I emphasize the need to be accurate in spelling and grammar.
Recently, having interviewed candidates for a teaching position in our Business Deptartment at school, some of the people were not invited to a interview because they had spelling errors, or made errors in grammar on their letters of application. We teach the importance of accuracy in spelling and grammar. But I can understand how someone who felt they were weak in these areas would "hang" back and not express themselves! Maybe the use of good spelling checkers and grammar checkers will release them to express themselves?

Linda Vaughn

Joan Winsor has been a Special Education teacher in Palo Alto,CA for 25 years and became hooked on telecom as a participant in last year's ESTTI

Graduate courses offered on MIX

MIX will be offering graduate level courses online this fall through the services of Connected Education, Inc. Academic credit will be granted by The New School for Social Research in New York. The courses, taught entirely on MIX, are loosely structured to accomodate student schedules and to facilitate daily interaction between teacher and student. Each course lasts two months.

Tuition is $888 per course and includes all connect costs (with the exception of long distance calls to Tymnet if needed.) There is a registration fee of $60. Each course carries three New School non-matriculated credits. These credits can be applied either toward degrees at your own local institutions if they accept the transfer credits, or toward degree programs at The New School itself, including a MA in Media Studies.

Courses are conducted entirely in an electronic "computer conferencing" classroom environment where faculty and students enter comments and messages electonically in a continuing exchange throughout the course. Students can read and retrieve material entered by faculty and other students, as well as ask questions anytime, night or day. Students can communicate with faculty through private email. The result is a very stimulating intellectual enviornment, described by previous students as akin to "top-notch seminars" and superior to most of the in-person courses they have taken.

All students will have access to the online Connected Education library, containing hundreds of papers pertinent to the courses and to computer conferencing.

Fall 1987 online courses: October 1-November 31

TELECOMMUNICATIONS IN EDUCATION

(Tom Hargadon)

A practical survey of new electronic communications media and their impact on the world of education today: computer networks, satellite communications, computer conferencing, classroom telecommunications projects, online data bases.

DESKTOP PUBLISHING

(Richard Dalton)

This course covers the new potential that low cost desktop publishing systems have, both for large and small school districts.

Other courses:

Computer Networks and Professional Writing
Telelaw: Legal Issues in Telecommunications
Electronic Publishing
Professional Management in the Information Age
The Languages of Documentary Film
Science Fiction and Media
Ethics in the Technological World

(Editor's note: join telecom/2.news or contact plevinson on MIX)

(FUNDS cont. from page 1)

from $3.2 million to $1.6 million. The project would establish intensive telecommunications by putting a mainframe computer in the county offices. The counties would subsidize access to it and provide instructional applications.

According to Dr. Wendy Harris of California's Office of Educational Technology, they might not be able to implement the state-wide telecommunications project at all with the remaining $1.6 million.

Ten TECC centers still remain open with the support of their county offices, and must be self-supporting by next year.

Richard Johanson, Corporate Benefits Manager for Fairchild Semi-conductor Corp. has been involved with the TECCs for four years as a representative of industry or business (the TECC statute requires that someone from business or industry sit on each TECC's board of directors). He says Fairchild has put $100,000 into the TECC in an effort to carry out math and computer literacy.

"We're trying to affect changes in content curriculum and computer literacy education and the TECCs have been the most valuable and effective means of doing this," Johanson told MIX.

-by Amy Pampusch

(Editor's note: look for updates on California funding issues in the ca.info conference on MIX)

Telecom broadens scope of students and teachers (cont. from page 1)

difficult, but many students enjoyed the sense of mystery. A very bouncy exchange was established between a 14 year old male athlete and a lively 18 year old girl!

For students who have never seen the ocean, reading about it in books answers only some of the questions. However, being able to ask other students questions about their ocean environment gives additional information. Are you worried about shark attacks? What does the seashore look like in the morning? Is it calm? Have you ever seen a dolphin? What was it like? These are some of the questions asked and answered.

Background material for reports, essays and assignments that was not available through the school library was readily accessible via databases. Students would be present when I accessed the information and were given a word processing file containing the information. Because the access time was relatively short, the students tended to spend more time analyzing the information and adding their own thoughts rather than just fact copying.

Integration of subjects involves teaching concepts when and where they are needed rather than in a specific classroom with a particular teacher. Telecommunications is a tool that helps make the boundaries between subject areas disappear. Students were able to go to a math teacher to have their English assignment proofread, and a math teacher worked with students on peace issues and historical questions about Abraham Lincoln.

Since I was the "telecommunications expert" for a team of three teachers, I would see and edit all of the telecommunications material. As a result, the English teacher stepped in and helped in my math classes. When the students saw the teachers moving easily between subject areas, the students started integrating as well. Many of the activities on the networks are a logical extension of what is done in classrooms. Thus, it is a tool for process learning.

For further information, email me at MIX. My system name is whay.

William Hay teaches in a middle schools leadership program in Surrey, British Columbia. His program emphasizes the integration of curriculum.

STIX. . . STUDENT INFORMATION EXCHANGE

The place for kids to MIX!

Online Abe Lincoln brings insight to our future leaders

(Editor's note: Look for David Pierce on STIX as other living historical figures like Rosa Parks and Eleanor Roosevelt.)

"Let me be somebody else!" MIX's online Abraham Lincoln, David F. Pierce said when teacher/MIX moderator Jeff Holte took his computer away.

Their student telecommunications project was over.

"Let me be Gandhi!" Pierce pleaded, contending that he would play the part of any of his personal heroes if he could just keep the computer and continue being online.

Pierce, a computer illiterate who professes that his only knowledge of computers was that the word didn't start with a 'k.' He was not so impressed with telecommunications after his first attempt at logging on one Friday afternoon.

After seven minutes of "humor for educators" in the *laugh* conference, Pierce found himself in a MIX black hole, (a.k.a. the online editor) with no idea how to get out. When in doubt, turn it off, he thought.

The computer sat on his kitchen table, dormant and black-screened, until the following Monday, when veteran MIX-user Holte talked him through his first successful online session. Pierce became enamored (of telecom that is, not Holte.)

Holte found this postmortem Lincoln through the Community Resource Pool (CRP) of Edina. CRP provides volunteer presenters for public and private schools in Edina, Richfield and Eden Prairie, MN.

"I have developed a heartfelt interest in several people, of which Lincoln is one," Pierce says as he runs his hand over a book from his 1894 limited-edition, 12-volume set of Lincoln's complete works.

Lincoln, Dr. Martin Luther King Jr., Hubert H. Humphrey, Woodrow Wilson, Gandhi, Pierce's mother and father and Henry David Thoreau all share those things that David Pierce's heroes are made of: selflessness, truth and moral integrity, abhorrence of war and the desire to strive for peace.

At age 36, Pierce has completed his B.A. in Communication from American University in Washington D.C., and will have his M.A. in Speech Communication from the University of Minnesota in December.

Pierce has stood in front of classrooms of kids playing Blowin' in the Wind, spoken to kids about Martin Luther King Jr. and portrayed Abraham Lincoln on MIX. His motivation goes beyond just helping kids understand pacifism and its advocates.

"I'm a little bit of a ham," he admits.

--By Amy Pampusch

Amy Pampusch is a MIX assistant editor

For three weeks beginning last May 20, Minnesota's primary and secondary school students electronically queried Minnesota Gov. Rudy Perpich on MIX.

Grade-school students tended to be curious about Gov. Perpich's children, whether he had a pet, or what his favorite food was.

Curious junior high and high school students delved into such subjects as ground water clean-up and the governor's reason for raising Minnesota taxes. A group of students even collaborated and asked him whether he thought President Reagan was guilty of lying about the Iran-Contra arms scandal (the governor declined to answer that question.)

Gov. Perpich was encouraged to get online after a pilot question/answer project with students and four Minnesota legislators proved successful.

Because the conference was held near the end of the school year, the governor only had the opportunity to answer questions, and didn't engage in online conversation with each student. There are tentative plans to have the governor online again this year at a time more conducive to that kind of interaction.

Gov. Rudy Perpich (seated) is at the Capitol with (from left) teacher Jeff Holte and his students Jennifer Bergmann and Todd Maxwell.

STIX Projects1987-88

STIX (Student Information Exchange) lets students of all ages and from all parts of the world, share information, ideas, and data via the MIX network. STIX projects allow students from anywhere on the globe to meet in computer network conferences, accessed by their teachers. Shared writing, science data collection experiments, and conversations with nursing home residents are examples of our student to student projects. STIX also provides regional and national experts, politicians and celebrities for online dialogue. Since STIX is a flexible system moderated by educators like yourself, your ideas for a student telecommunications project are encouraged and welcomed. Contact Griff Wigley (gwigley) on the MIX network.

Stix.talk will function as a clearinghouse for all STIX projects. It is for educators who might want to find out about available student projects or who want to discuss educational issues that relate to particular subject areas. In the *stix.talk* conference there are listings of current and upcoming STIX events and a place for educators to discuss issues related to particular subject areas. The news topic will contain information related to current and upcoming STIX events and conferences. MODERATOR: GRIFF WIGLEY (gwigley).

MATH AND SCIENCE CONFERENCES

PROBLEM.SOLVING

A conference to discuss problem solving and house problem solving projects. One of these will be a compilation of student created problems that one "team" develops to be solved by another "team." Problem solving contests of various sorts will occur in this conference throughout the year. MODERATOR: PAUL GIGANTI (pgiganti).

ASTRONOMY

A conference featuring the staff at the Minneapolis Planetarium. They will be available throughout the year to answer teacher and student questions about astronomy. You may also participate in some online astronomy projects and discussions of special topics of interest held throughout the year. All grade levels are welcome and discussions will be geared to the appropriate level. MODERATOR: JEFF HOLTE (jholte)

"Wind is caused by a huge 'wind machine' that sits off an island in the Pacific Ocean." -Dr. Misconception

Don't let Dr. Misconception **twist** your students! Straighten the doctor out! Classrooms from all grade levels may present their correct explanations for science phenomena. Students will need to think about, discuss, and describe science phenomena to Dr.Misconception who is not easily convinced that he is wrong (and he always is!) . Students will think about scientific method, theories, fact vs. myth and will use logical reasoning. Different topics are presented throughout the year. MODERATOR: KEN EVANS (kevans).

WATER

We all need water. We use it for travel, play, hygiene, and for drinking. We even like to look at it. Yet there are serious water pollution and shortage problems. We will be conducting some online fresh-water and salt-water experiments utilizing the data students from all over the country send in. Instructional activities will be designed for students and teachers. We will also have guest water experts to answer questions and provide data analysis. The conference will be ongoing throughout the year and experiments will occur periodically. MODERATOR: JEFF HOLTE (jholte).

PLANTS

Students from a variety of geographical areas throughout the country will grow plants, measure and send growth data to STIX so other participants can use it for graphing, analysis, etc. We will have some online input from scientists to help evaluate results. MODERATOR: JEFF HOLTE (jholte).

WEATHER

An exciting conference exploring various aspects of weather. During the year there will be online weather experiments such as temperature collection, etc. We will also have weather experts online to discuss questions your students have concerning the whole area of meteorology. They may also ask some interesting questions of your students. You may also search past weather conversations with weather experts. MODERATOR: JEFF HOLTE (jholte).

SCIENTIST

Scientists from the past, present and future will be online to answer questions. Galileo, Aristotle and Copernicus will visit the conference and students will have the opportunity to ask them questions to learn more about them and their laws, theories, and discoveries . Real scientists from the present will be invited online to discuss their work with insect control, or a wildlife management scientist might discuss a threatened species of animal, and what steps need to be taken to preserve the species. A future scientist may visit and talk about the future of science. Topics may include health care techniques, recycling of critical materials, enviromental issues, the "ozone" threat, death stars and others. MODERATOR: KEN EVANS
(kevans).

EXPLORE.INVENT

In this conference classrooms will be able to discuss issues with people such as Thomas Edison, Leonardo da Vinci and present day explorers and inventors. Questions as to why their adventures and inventions were significant and the impact of their lives and work on society will be addressed. There will be some challenges, in the form of a contest, from our guests to your classes. Look for the Ultimate Exploration Contest, where students from around the country submit entries to be judged by our online guests. MODERATOR: KEN EVANS (kevans).

FLAT.EARTH

"Of course the earth is flat. And I can prove it!" -Captain Flathead.

Captain Flathead will be online in the fall and spring to represent the Flat Earth Society. He will counter arguments proposed by classrooms of students. The classrooms will provide arguments for the belief that the earth is indeed spherical. MODERATOR: KEN EVANS (kevans).

LANGUAGE ARTS CONFERENCES

STUDENT. BOOKS

Classrooms across America focus on their reasons for favoring a particular piece of literature. Individual students will write evaluations of those books they have read. Each class will then select a representative piece of literature to be submitted. These will be compiled into a national database of classroom-selected pieces of literature that reflect the geographic, economic and lifestyle choices of students from all parts of this nation. Follow-up classroom activities for using literature databases in the classroom will evolve from this project. They will incorporate the classroom use of thinking skills in the management of this exciting information. MODERATOR: STEVEN PINNEY (spinney).

ROUND.ROBIN

Join a team of classrooms across the nation as they cooperatively agree on the elements of an exciting adventure. Once a rotation schedule is agreed on, each classroom has ample time (using the writing process) to provide their chapter to the continuing saga. Imagine how exciting it will be to watch the perspective of students in parts of the nation quite different than your own influence the character development in a shared piece of written literature. Enhance your writing project by joining this exciting use of telecommunication in the classroom. MODERATOR: STEVEN PINNEY (spinney).

PENPALS

Want to broaden your students' horizons? Curious about how people in distant places live and feel? Then the *penpals* conference is the place for you. In *penpals* you'll find a database of other teachers interested in writing exchanges, tips and guidelines on how to organize a successful exchange, monthly suggestions for writing themes and postings of student project opportunities on MIX. Penpals will be a place to discuss, improve, and critique student writing exchanges at all grade levels. Join *penpals* and help your students connect with the world. MODERATOR: PETER HUTCHER (phutcher).

LOGO.PENPALS

Students working with Logo will exchange penpal letters with students from other classes that will include personal symbols designed with Logo software. The programs for the symbols will be transmitted in this conference, along with the letters, so that students will get a chance to see how others are working with Logo as well as to learn more about each other. MODERATOR: ARDYCE EHRLICH (aehrlich).

DEBATE

Two high school debate teams follow the formal rules of appropriate debate strategies to argue a teacher-specified topic. One team starts off with the debate as the second team waits for its opportunity to respond. Once the debate begins, each team builds its side of the argument off-line and uploads to MIX. Classrooms across the nation watch the dynamic excitement of this provocative process. They have an opportunity to discuss its merits as well as their reactions during the progression of the debate in a public forum topic. MODERATOR: STEVEN PINNEY (spinney).

TIME.CAPSULE

A recently published photojournal "A Day in the Life of America" contains the photos of several dozen photographers that were taken across America within one 24 hour period. In a similar effort, students in classrooms from all corners of the United States will offer their perspectives. One day this Fall students across the country will write descriptive articles about local people, events or issues sharing the diversity of our many locales and lifestyles. To capture the moment all articles will be written on one special day and be revised during the remainder of that week. Selections will then be sent to MIX where a published document of teacher selected writings will be sent to all participating schools. MODERATOR: STEVEN PINNEY (spinney).

WRITERS. ASSIST

Students are no longer limited to the person sitting behind them in the revision of their writing projects. MIX now offers the Writer's Assistance Network. Classrooms across America are now networked into cooperative editing teams helping each other as they build writing projects to the publishing stage. Classrooms post a "Help Wanted" ad on MIX and connect with another school to begin cooperative editing functions for each other's writing as it moves from prewriting to roughdraft and into revision. Expand your writing audience to other students around the nation. Offer each of your writers his/her own personal editing team. Support your writing projects with The Writer's Assistance Network. MODERATOR: STEVEN PINNEY (spinney).

SOCIAL STUDIES CONFERENCES

DECISION

In *decision* we will help build critical thinking and decision-making skills by examining the consequences of decisions made in a series of simulated situations. The " Decisions, Decisions" series by Tom Snyder Productions will serve as the focus for this conference. Each program in this series examines an issue such as immigration, urbanization, or media ethics and we'll extend that using online discussions and comparisons of the processes and experiences of participants. Join us in *decision* for an exciting exploration of students' decision making processes. MODERATOR: PETER HUTCHER (phutcher).

POLITICS

Ever wish you could ask a senator or representative why they voted a certain way on a particular bill? Been curious to know whether your governor had a pet or likes animals? Through *politics* students have the chance to pose questions of all sorts to a variety of local and national political figures. Each will be online for two to three weeks, available to answer student questions of all kinds. A schedule of who will be on, and when, will be available soon and will be posted in the *politics* conference. MODERATOR: JON GORDON (jgordon).

SURVEYS

Geographically distant classes team up in pairs to create, compile, analyze and report the results of surveys. Students must use word processing, database, spreadsheet and graphing application software to complete the task. The student-created survey forms, the raw data and the written reports are posted in a common place online so that other classes may use the forms, continually add to the data and compare conclusions. Survey results are then made public via letters to the editor of local newspapers, articles in school newspapers and district newsletters, letters to local public officials, etc. MODERATOR: PAUL GIGANTI (pgiganti).

S[illegible] News

Student Press International is the Associated Press for the under-18 crowd: a place for student writers from junior high schools and high schools around the country to share their news stories and information. Stories pertinent to the student population as a whole will be put "on the wire" via MIX for other subscribing schools to access for publication or information. Once enough online material is generated, regional STIX newspapers will be put out by a core of student editors. Look for online versions of established student publications as well. MODERATOR: AMY PAMPUSCH (apampusch).

VACATION

Practice your map reading skills as you plan to take an electronic vacation in cooperation with another class in an unknown, remote location! Research and write travelogues, historical guides, profiles of your community to share with other classes. Use your word processing skills to "publish" brochures to be sent to your "guests." Learn about other parts of the world as you take a guided tour provided by a host class. If "traveling" to "visit" another school, try to guess your final destination before your "arrival" by using daily "clues" provided by your "hosts." MODERATOR: JOAN WINSOR (jwinsor).

VIDEO

Student video productions are becoming quite common. The *video* conference is a place to discuss tips and guidelines for effective use of video, the ITV series, and related video technologies such as CD-ROM, laserdisks, and digitizers. It will also be the place to coordinate the sharing of video productions done by students. A topic will be reserved to house a listing of student-produced videos that people would be willing to share with others. These video productions can range from "tours" of your school building and community to videos produced relating to existing curriculum areas. MODERATORS: JEFF HOLTE (jholte) and PETER HUTCHER (phutcher).

OTHER.SIDE

"The Other Side" software is an excellent tool for learning about conflict resolution. In the MIX version, two games will be played simultaneously between students in different parts of the US, Canada and perhaps Australia. Email messages will be used to communicate the moves. There is a requirement that the schools have a copy of the program and are prepared to send regular daily messages. Time frame: 4 to 6 weeks per game. Time commiment: 5 to 10 minutes per day plus 1 to 2 minutes of MIX time per day during the game. Grade level: Intermediate, Middle, Secondary. MODERATOR: WILLIAM HAY (whay).

EXTRA.EXTRA

As major national and global events occur, a set of activities involving experts and news media accounts of the event will be available within a short time for students to participate in that are designed to enhance their involvement and understanding.

1. Newswire accounts of the event will be available for downloading along with a brief set of questions designed to assure fundamental knowledge of the important information.

2. Anytime an important national global event occurs, politicians, government officials, professors from colleges and other key people who are knowledgeable about the situation will be scheduled for a limited online appearance. They will not only post their particular views, but more importantly, interact with students directly. Teachers select questions and comments generated by students and post them online. When the visiting expert responds, the students are expected to respond back so that true interaction takes place and students are challenged to defend their position.

3. Newspaper coverage of certain events can dramatically vary from state to state and especially country to country. Participating classes will post the headlines used by their local newspapers so that comparisons can be made. Student analyses, either individually or cooperatively written, are then posted online for others to read and compare. In cases where students think that the newspaper's headlines were inaccurate or misleading, letters to the editor will be written, and when possible, sent electronically via MIX or other electronic services.

4. Certain events require decisions from politicians, government officials, managers of corporations or administrators of non-profit organizations. Students need to be shown that citizen expression of opinions can often impact these decisions. Each event selected will have a definite time period in which online activities will occur. Generally, a 5 to 6 week committment will be required if a teacher wishes to have a class participate in all activities. MODERATORS: JON GORDON (jgordon) and LYNN SCHRUM (lschrum).

ZOO

Lions and tigers and bears, oh my! The Minnesota Zoo in Apple Valley, Minnesota will be online to talk with teachers and students. Zoo personnel will:

- Provide information about zoo activities.
- Provide access to the Minnesota Zoo's online animal data base.
- Have interactive discussions with zoo staff with periodic topics of interest and ongoing discussions.
- Provide teaching materials, current articles, and discussion with teachers related to zoos. MODERATOR: JEFF HOLTE (jholte).

LOCAL.STUDIES

In this conference a variety of projects will occur. Basically, any project related to your own local community may take place here. Besides the projects listed below you may have a project that your class would like to try.

- Local geography:

A collection of physical, historical, economic, and cultural features of your community. These can be collected and shared with others on MIX.

- Local historical events:

A collection of significant historical events that took place in your community. Students write as reporters who were there. These can be collected and shared with other schools.

- Local historical figures:

A collection of significant historical events that took place in your community. These can be collected and shared with other schools.

- Cemetary data:

Collect data from a local cemetary to analyze life span, population patterns, and other interesting information that can be obtained from gathering such data. Student gathered information from other cemetaries will be available to make comparisons between communities using a data base. Projects may be supplimented by the creation of video tapes or photographs which may be shared with other schools. MODERATOR: JEFF HOLTE (jholte).

SENIOR.CITIZEN

Knarly: The state of not mixing
Radical or rad: Far out, cool
-6th Grade Students
Cats meow: upbeat
Land sakes: surprise
Hoppin Jimminy-:amazing
-Chateau Healthcare Center residents

Nursing homes from various places will be online to match up with classrooms of students of all ages. Residents of these nursing homes and students can share electronic mail messages and discuss topics of interest. Collections of students' and residents' favorite sayings and expressions, real-life stories from both generations, and other surveys and activities will make this a meaningful experience for students. MODERATOR: JEFF HOLTE (jholte)

INTERNATIONAL

Quite a few international projects will be occuring on MIX this year. Australian schools will be online along with a variety of others.This conference is designed to be a clearing house for all international projects on MIX. If you are interested in having your class conduct a project with a class from another country, or you want to know about life in another country that is participating in MIX, this is the place to go. The moderators can tell you about various international projects found on the network. We can also discuss appropriate issues related to international education such as global education. MODERATORS: JEFF HOLTE (jholte) and PETER HUTCHER (phutcher).

YOUR PROJECT

Designed by you, this project utilizes your curriculum specialty as well as your ingenuity. Contact Griff Wigley (gwigley) if you wish to create your own STIX project.

STIX Project Calendar

1987-88

All Stix conferences are listed below. Conferences are yearlong except those marked with * . Check the chart below for the time frame of those conferences.

MATH/SCIENCE

Plant *
Twisted.Science
Explore.Invent *
Scientist *
Flat.Earth *
Zoo *
ProblemSolving
Weather

SOCIAL STUDIES

Water
Extra.Extra
Decision
Surveys
Local.Studies
Politics
Living.History *
Sayings
Student.Press

LANGUAGE ARTS

Vacation
Logo.Penpals
Student.Books
Senior.Citizen
International
Debate
Penpals
Video
Round.Robin
Time.Capsule *
Writers.Assist

SEPTEMBER

Scientist: Ask a Scientist
Living.History: Constitutional figures

OCTOBER

Zoo: Reptiles
Scientist: Ask a scientist
Flat.earth: Session 1
Plant: Project # 2
Living.History: Constitutional figures
Explore.Invent: Tom Edison

NOVEMBER

Explore.Invent: Real Explorer
Zoo: Animal Care
Scientist: Charles Darwin
Living.History: Industrial Revolution.
Plant: Project #2
Time.Capsule: Writing Project

DECEMBER

Scientist: Charles Darwin

JANUARY

Zoo: Big Cats
Scientist: Real scientist
Explore.Invent: L. da Vinci
Living.History: Civil Rights

FEBRUARY

Zoo: Vanishing wildlife
Scientist: Aristotle, Galileo, Copernicus
Explore.Invent: Real inventor
Living.History: Presidents

MARCH

Zoo: Animal training
Scientist: Aristotle, Galileo, Copernicus
Flat.Earth: Session 2
Explore.Invent: Real explorer
Living.History: Average person

APRIL

Zoo: Zoo keeping career
Scientist: Albert Einstein
Flat.Earth: Session 2
Plant: Project #2
Explore.Invent: to be announced
Living.History: Flight

MAY

Scientist: Future scientist
Plant: Project #3
Explore.Invent: To be announced

MIX SYSTEM ANNOUNCEMENTS

Hosts

Each subscriber is now offered a "host" who, through email, provides whatever assistance you might need in order to become familiar with the online environment. Hosts answer questions, explain system commands, refer newcomers to conferences, and introduce them to others already online. We also offer hosts retroactively to anyone who feels they would benefit from some personalized help. To "get hosted" send an email message to Joan Winsor (jwinsor) or Kitty Carton (kcarton) and keep an eye on your MIX mailbox for your first message.

MIX.Match

A database of MIX subscribers designed to let you search for those subscribers who have specific interests or professional needs, similar jobs, curriculum specialties or classes compatible with yours who are interested in online projects . Listing in the database is optional. If you are interested please send the following information to Kitty Carton (kcarton) or Joan Winsor (jwinsor): **Name, username, position, school/organization, work address, professional areas of interest, other interests, whether you are interested in online projects with your students, and the curriculum area interests of these projects.** The material you submit can be changed or withdrawn at any time by contacting your host via MIX email .

Education.tech

A group of conferences designed for the educator interested in technology including:

- ***Tech.leader:*** Online workshops about various aspects of educational technology. Each month there will be a theme on the integration of technology into a particular area of the curriculum, while another theme will focus on a technology-related issue or problem facing educators. Guest experts will be invited to present their thoughts during each of these workshops and interact with MIX subscribers. Themes include: Computer Science, Special Education, Math, Guidance and counseling, Music/Art, Language Arts, Science, and Social Studies. Monthly themes focus on educational technology issues like computer equity, measuring the impact of technology, teacher training issues (inservice, certification, preservice), instructional management systems (testing, mastery management) student information systems (scheduling records, attendance), videotape technology, other video technology (CD Rom, interactive two-way) being a technology/computer coordinator, and technology and the skills of the future.
- ***Telecom and tele.library:*** Monthly guests in the area of educational telecommunication appear online in the telecom conference. Guests this past month were telecommunication experts Stan Silverman of the New York Institute of Technology and John Southworth from the University of Hawaii. *Tele.library* contains the full text of readings and articles on telecommunication. Watch for announcements of other *telecom* guests appearing monthly thoughout the year.
- ***Logo:*** Keep in touch with new developments in Logo. This conference provides Logo classroom projects for you and your students. It also answers your questions about Logo, offers a place for people interested in Logo to communicate with each other, and provides a forum for discussion of Logo and all issues involved with its implementation.
- ***Microbytes*:** Get all the fast breaking computer industry news twice weekly. Ported from another McGraw-Hill network called BIX (Byte Information Exchange).
- ***Apple.2 and Macintosh:*** Moderated by Paul Musegades from Apple Computer, these conferences cover news, software, hardware, peripherals and telecommunications specific to the Apple II and Macintosh line of personal computers.
- ***Appleworks*:** Appleworks software tips, questions, macros, lessons and discussion.
- ***Netweaver:*** Newsletter of the Electronic Networking Association(ENA), an organization of computer conferencing professionals. Their monthly newsletter is called The Netweaver and is created and distributed electronically nationwide.

Professional

- MIX is evolving into more than a network for educational technology. The professional group of conferences is our name for the online activities that can enhance you professionally and personally. During the 1987-88 school year we plan to have several symposiums on important developments in education. **Fall: Structual reform, Winter: Writing across the curriculum, Spring: Cooperative learning**. Experts in these fields will be available online to interact with you. More details will be available in October.
- For MIX members to gather , relax, and socialize there's the *lounge* conference. Join in or initiate conversations on anything that's on your mind, be it education related or not. As this global online educational community called MIX evolves, we need a place to meet casually as peers, interested in education, and interested in each other. So take your time to check out the "atmosphere." If and when you feel ready to make an appearance, rest assured you will be warmly welcomed.
- MIX participants can gather together to seek and lend support to each other in the support.grp conference on MIX. Both personal and professional issues are discussed. Any MIX subscriber may request to join. Send email to Linda Vaughn (lvaughn).

State Groups

The Minnesota Department of Education has adopted MIX as the educational telecommunications network for the state. MDE.Net will be an important communication vehicle between the department and Minnesota educators. The October issue of The Online Educator will contain full details. California's educational technology news, calendars, issues and rumors are posted and discussed in the *ca.info* conference.

National Associations

Conferences devoted to the needs of particular educational associations. will become increasingly popular in the upcoming year. Watch for announcements on conferences sponsored by the International Technology Education Association (ITEA) and the National Business Education Association (NBEA).

Ask.MIX

Got a question and not sure where to ask it, let alone where to find the answer? Just *ask.mix*. Anything about anything to do with MIX. When? Where? How? Why? You may find us asking you questions in *ask.mix* as well. This is part of our customer support process in which we actively solicit your input .

California institutes let teachers see educational benefits of technology

The nation is watching California as it takes major steps toward realizing its dream of integrating technology into the curriculum.

A few years ago the Educational Technology Advisory Committee helped fund the development of manuals and materials to accomplish this task. Known as the TIC (Technology in the Curriculum) materials, these were distributed to every school in the state. The materials consisted of cross-referenced books detailing software and instructional television programs and where they fit into the state frameworks of curriculum.

At the time these materials were being finished, a new problem arose. What exactly would the schools do with these wonderful things? A need for some knowledgeable teachers who could train others was identified. At this point the state moved quite rapidly and devised a plan to train 800 teachers in an innovative and intensive manner.

In the summer of 1986 there were four technology training institutes: Elementary, Math Science, Language Arts, and History-Social Studies. At each site there were 200 teachers living in dorms and receiving all-day training.

The sessions emphasized curriculum, effective application of technology throughout the curriculum, and the planning and delivery of effective inservice training. The goal was to have these educators return to their areas, develop model classrooms using technology and provide inservice instruction to others.

California is the first and only state to run institutes like this and most people feel these institutes are extremely successful. Teams from all over the state have been presenting to their colleagues and have established themselves as future leaders in educational technology.

Two of the institutes, Math Science (MSTI) and Elementary (ESTTI), gave modems to all participants. With the modems came 10 hours of time on MIX. Participants also got a stipend that they could receive in the form of a computer, other hardware or money.

This summer the Elementary institute was held again at San Bernardino, Math/Science at Berkeley and a combination of History-Social Science and Language Arts was held at Irvine. They will continue to be intensive, exciting and enriching experiences for the participants and a great benefit to the state.

-By Lynne Schrum

Lynne Schrum is a resource specialist and was a 1986 ESTTI associate

FCC proposing telecom access rate hike

On July 10, the Federal Communications Commission (FCC) proposed that companies like Tymnet no longer be exempt from paying interstate access charges as of January 1, 1988. That added cost is expected to be passed on to telecommunications networks and their subscribers.

The FCC estimates the added access charge might add up to an additional 9 cents per minute for each user, but the commission contends that present exemptions mean that business and residential telephone users are subsidizing telecommunications networks. Tymnet currently rents private telephone lines.

This month, the FCC will be "testing the waters" by discussing the access charge issue. A letter writing campaign has been generated by MIX subscribers and by other networks as well.

Deadline for comments is September 15 and the FCC is required to respond to those comments by October 15.

(Editor's note: Watch the MIX lounge and ca.info conferences for updates on the FCC proposal.)

Technology association explores new medium

We are living in a unique age: a time of unprecedented change brought about by technology. How do people apply technology, how does it affect their everyday lives, and what should be taught about technology to members of our society?

The TechnologyLink on MIX created by the International TechnologyEducation Association (ITEA) addresses these questions and more.

Through technology we apply our knowledge of math and science to increase our potential, solve practical problems and ultimately modify our world and make it more enjoyable.

In itself, technology is rigid and inhuman. It offers no solutions. Managed, technology is flexible. Understood, it can be adapted and changed as needed, or wanted.

As part of the school curriculum, technology education teaches students to understand, use, and control technology's affects on people, the environment and society. Students learn how to adjust to change, to deal with forces that influence their future, and to participate in controlling their future.

To help students develop insights into the application of technological concepts, processes and systems and to help prepare them to be active participants in controlling their future, the ITEA is using the TechnologyLink group on MIX. It will provide resources that will assist teachers in preparing students to be productive citizens in the 21st century.

TechnologyLink is for professionals interested in providing comprehensive, action-based educational programs concerned with technology, its evolution, utilization and significance. It's also for those involved with industry; its organization, personnel, systems, techniques, resources and products and its social/cultural impact on society.

Given the reality of today's world, technology education is the new basic.

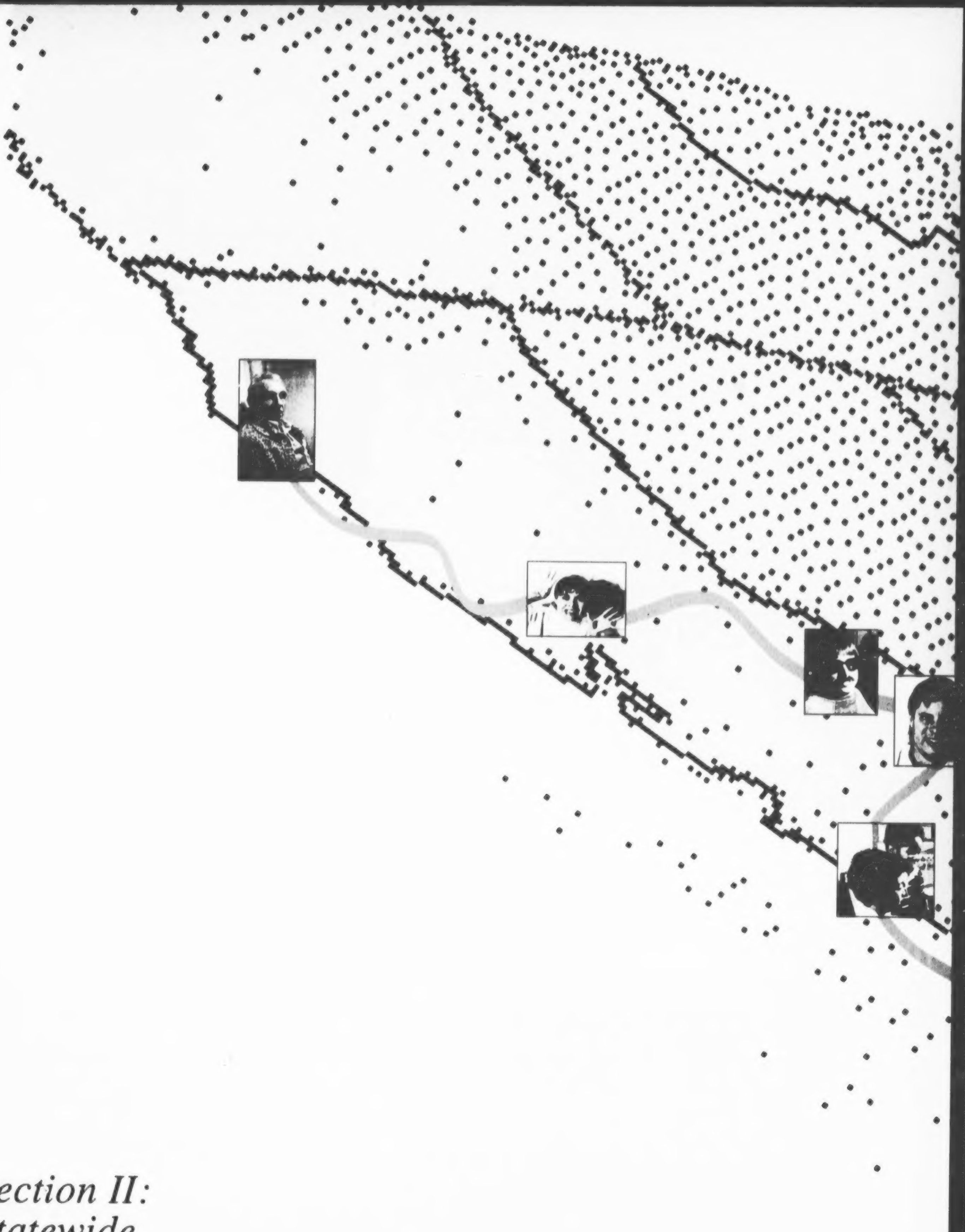
-By George Willcox

George Willcox is state supervisor, Technology Education Service, Virginia Dept of Education

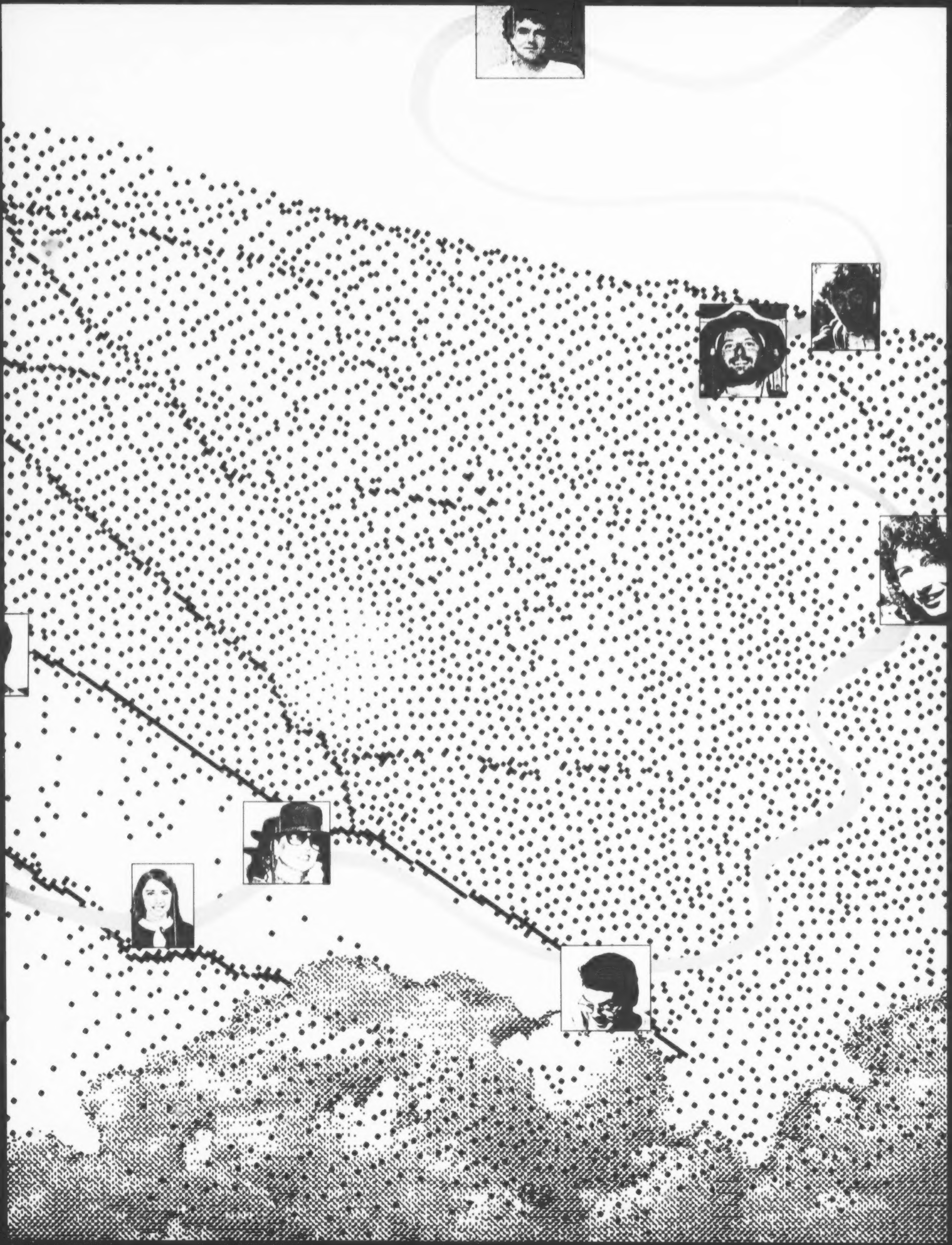
Stephen M. Laliberte

Stephen M. Laliberte is director of new product development for Educational Management Services, a division of McGraw-Hill, Inc. He is responsible for developing products that are delivered electronically in forms such as computer conferencing, full-text retrieval, and compact digital ROM. The goal is to make materials from McGraw-Hill—including books, tests, magazines, and data bases—available to educators in an electronic format.

Currently Mr. Laliberte publishes the McGraw-Hill Information Exchange (MIX), an information service dedicated to serving the needs of educators. He is the author of the McGraw-Hill Interactive Authoring System, a software program that allows educators to create computer-aided instruction without using a programming language.



Section II: Statewide Networks



Statewide Networks

The projects in this category were initiated by state education administrations to address their concerns for access and equity in education. These SEAs recognize the need for immediate and efficient communication among administrators, and see computer networking as an efficient way of handling information sharing and data transfer. The programs discussed here are a sample of the many projects being implemented all over the United States.

Florida's FIRN project, one of the first state-administered networks, meets several needs, providing data-base access, information transfer, news dissemination, and software reviews. Careful planning and built-in system expandability have contributed to the longevity of this project. In his paper on FIRN, Francis Watson reports that all 67 of the state's local school districts and all 28 of its community colleges will soon be on-line, connecting the entire state education system.

Molly Watt and Dan Watt are education consultants working in New Hampshire. They have been in the forefront of the movement to incorporate the benefits of technological advances in that state's education policy. In their paper they describe some of their earlier dreams for the possibilities of computer-based telecommunications, and the steps that were taken to try to make those dreams a reality for New Hampshire students.

In her paper on AppleLink®, Stacey Bressler describes that networking system as it is used every day at Apple Computer, both locally and around the country. Bressler illustrates some actual education department snafus that could have been avoided with an information-management system like AppleLink. The following article, by Larry Vaughan, discusses how the AppleLink system was adopted by the state of New Hampshire in a pilot program called EdLink. New Hampshire's educational administrators now have immediate access to the data base as well as conferencing capability, which enables them to perform their tasks with the up-to-the-minute information they need.

Florida's and New Hampshire's network projects are examples of telecommunications among education administrators. In Maryland's METN system, the beneficiaries are primarily students and teachers. Michael Sullivan describes the thinking that went into the origin of Maryland's effort to address the need for instructional computing. Having come through changing economic conditions and varying waves of political interest in the project, METN today is a system of more than 30 schools with complete local area network setups and telecommunications and limited software broadcast capability.

Florida Information Resource Network

Francis C. Watson

Introduction

The Florida Information Resource Network (FIRN) is an ambitious effort being undertaken by the Florida education community and the Florida Legislature to electronically link all agencies, institutions, and schools in its public education system. Perhaps the most advanced educational data communications network in the nation, it has three main purposes:

- To provide equal access to computing resources for all public education entities in the state, for administration and instruction
- To reduce the data burden on teachers and administrators while providing timely, high-quality data for managers at all levels
- To rapidly and effectively exchange computerized information within the public education system

Data communications equipment located in strategic centers throughout the state is being used to connect all 67 school districts and 33 area vocational-technical centers, 28 community colleges, and the 9 state universities into the FIRN network.

Once completed, FIRN will allow the State Department of Education to communicate information electronically to all local education agencies, and it will allow those agencies to communicate reports electronically to the Department. The exchange of data/information between users will be in either batch or on-line mode, and will include interactive access to many data bases. It currently provides students and faculty on any given campus access to unique computing capabilities available on other campuses, and permits administrators in the more remote districts and colleges to use the computer resources of the more sophisticated districts and institutions.

History

The idea for FIRN was conceived and planned by the Florida Department of Education (DOE), school districts, and universities in a cooperative effort. It grew out of a statewide computer resource-sharing legislative program begun in 1977, further expanded an existing state university system computer network, and utilized other resources that were already in place. In response to a 1981 legislative directive, the DOE staff and the School District Council on Comprehensive Management Information Systems (SDCCMIS), representing the 67 school district superintendents and school boards, developed a long-range, five-phase implementation plan for FIRN. The plan was adopted by the State Legislature in 1982.

Phase I, which included the establishment of regional computing consortia, involved no new funding. It provided limited computing capabilities for all districts and laid the groundwork for electronic reporting to the DOE via magnetic tape.

In phase II, Tymnet Inc. was awarded a contract for a pilot project to demonstrate several required capabilities for Florida's electronic data communications network. These included (1) electronically transmitting student FTE funding data from a school district computer to a university computer serving the DOE in the state capital, (2) transferring student transcripts from a school district to a community college, and (3) linking a rural north Florida high school with a large south Florida school district 500 miles away, giving the rural school access to automated student information system services.

Phase III will be completed in 1987, when all 67 school districts will have a direct link into the network. As of August 1, 1987, 65 of the 67 districts have been connected as planned. The remaining two are expected to be linked by the end of 1987. By the end of 1988, all 28 of the community colleges will also be on-line.

Implementation of phases IV and V focuses on software development to support computer-based applications for the administration of public education. The network will provide interactive communication between districts, the DOE, and the Legislature. Ad hoc information retrieval and reporting of student-based educational systems also will be possible. Educational entities, down to the school level in phase V, will use automated data bases and remote data entry to fulfill state-mandated reporting requirements. Detail-level student and staff reporting systems, culminating phase V's implementation, go into effect July 1, 1988. Decision making at all levels will be enhanced by the use of more timely and accurate information.

While almost all objectives contained in the 1982 plan for FIRN have been accomplished, its potential in both instructional and administrative areas continues to be utilized for new and innovative purposes. Other state agencies are using the FIRN plan as a model to plan for additional state data communications networks in Florida.

Administration

Initially a one-year project, FIRN was guided by two oversight bodies:

- The School District Council for Comprehensive Management Information Systems (SDCCMIS), which has actively coordinated MIS issues among districts and the DOE for several years.

- The FIRN Technical Advisory Board. Comprised of data processing and data communication specialists from districts, community colleges, and universities, the Technical Advisory Board was established to guide vendor selection and evaluate the results of the pilot. It now provides guidance to the FIRN network staff on technical matters.

FIRN became an ongoing activity when the pilot project was successfully completed, and a "board of directors" drawn from FIRN's entire user community was formed to set policy and guide future development. The FIRN Coordinating Council was appointed to meet this need. It consists of the following members:

Florida's Commissioner of Education (chair)
Two university presidents
Two community college presidents
Two school district superintendents
One state university system MIS representative
One community college MIS representative
Four school district MIS representatives

The two original oversight bodies continue to participate in FIRN's management. The SDCCMIS is represented on the FIRN Coordinating Council, and the Technical Advisory Board is convened periodically to provide guidance on network problems, enhancements, and growth plans.

Funding

Funding is provided annually by general revenue appropriations specifically designated by the State Legislature for FIRN. This funding is managed by the DOE in accordance with budgets approved by the FIRN Coordinating Council. Since FIRN's beginning, its appropriations have increased in each July-through-June fiscal year:

FY 82–83	$ 518,577
FY 83–84	$2,279,895
FY 84–85	$4,396,415
FY 85–86	$6,278,230
FY 86–87	$7,778,230
FY 87–88	$8,606,284

Once FIRN has expanded to include all Florida public education users, its funding may have to be supported partially through user charges. For predictability, such a system is likely to be based on type and number of network connections, rather than connect time or characters transmitted, as is done in commercial packet-switching networks. Any new charging system will be phased in over a two-to-four year period.

State-level funding is used to operate and maintain the network, for the development of specialized application software for use within the DOE, and for applications software, equipment, and staffing at the local level to assure effective utilization of the network's resources.

Technology

Two physically distinct data communication networks comprise FIRN—one based on IBM's System Network Architecture (SNA) and the other on Tymnet's networking system, sometimes called an X.25 network. Bridges between the two provide equal access, allowing users connected to one network to reach systems attached to the other. The Tymnet side is a state-owned private network with access into Tymnet's international public data network.

The nucleus of FIRN/SNA is the state university system network linking five regional data centers. The university system network evolved during the 1970s as the regional data centers gradually established links among themselves. This allowed efficient movement of data between the nine universities and the Board of Regents, and permitted researchers at one university to use computer software and data bases housed at another.

Students were also provided instructional services through the network.

FIRN/Tymnet connects terminal equipment and computer facilities for which an SNA connection is not possible or desirable. It provides flexible support for low-cost dial-up asynchronous terminals, minicomputers (which support the X.25 standard rather that SNA protocols) and large non-IBM mainframes. It allows asynchronous terminals to access IBM data centers as if they were IBM 3270 terminals, and provides local dial-up telephone access for interactive and batch terminals in every major urban area of the state. FIRN/Tymnet provides a single unified system in place of its "plumber's nightmare" predecessor—a maze of multiplexors, protocol converters, and port selectors.

By combining these two networking technologies, FIRN is able to meet a much greater variety of data communication needs than could any single solution. This hybrid strategy allows FIRN to support users' existing equipment and software rather than forcing them to change solely to be compatible with a particular networking environment.

Applications

FIRN provides technical support for a variety of host-based applications accessible through the network, including:

- Batch transmission of data files to and from DOE
- Interactive access to DOE student data base
- Automated submission of quarterly FTE data to DOE for funding
- Automated submission of monthly district National School Lunch claims reimbursement forms to DOE
- Electronic mail for corresponding with other FIRN users
- Access into BITNET, the international higher education network
- Electronic bulletin boards for disseminating news items, memos, and bulletins from DOE

- Access to software and services for student record processing, including attendance, scheduling, and grade reporting

- Access to a computer-aided instruction system capable of course design for teachers, trainers, or curriculum developers

- On-line access to DOE teacher certification files

- Access to a data base of microcomputer instructional software evaluations

- Access to a data base of science test questions and objectives, elementary through high school (other areas under development)

- Access to CHOICES, a data base of career information for students

- Access to various Florida Department of Commerce data bases, including census data

- Access to a statewide postsecondary course numbering system

Security

Protection of data against unauthorized disclosure, alteration, or destruction has been a fundamental principle of FIRN since its beginning. In conjunction with the host data centers, FIRN employs a variety of technologies to provide a secure environment for the information resources supported by the network.

Problems

The evolution of FIRN has provided an abundance of challenges. The continuing support of the Florida Legislature, including but not limited to funding, has assisted in keeping problems to a manageable number.

Significant problems affecting FIRN's implementation include:

- Technical problems arising from linking various vendors' hardware and software
- The divestiture in the telephone industry, which has increased the complexity of data communications
- The lack of standardized data elements in local data bases for transmission through FIRN to DOE and to other users
- "Suspicions" between the different agency types—school districts, community colleges, and universities
- Politics associated with linking autonomous agencies into a unified network, including security considerations
- Training of personnel to effectively use FIRN, both at the state and local levels
- Acceptance of "radical" new ways of reporting data to DOE—individual rather than aggregate
- The natural reluctance of people to accept new technologies
- Funding—never enough to do what everyone wants to do, when they want to do it

The Future

By the end of the decade, the ability of DOE to provide timely and accurate information to the Legislature, State Board of Education, and others will be greatly enhanced. Florida school districts will submit almost all state reports electronically through FIRN. To satisfy this requirement, automated student, staff, and finance systems will be operational in each district. July 1, 1988, will see the implementation of the detail-level student and staff reporting systems.

Requests for transcripts will be fulfilled much more promptly when high school seniors' records become available electronically to both community colleges and universities. Similarly, transcripts for community college students will be available to universities. Support for a multitude of additional student-support activities will become commonplace. Two examples of such additional services being implemented during 1987–88 include a data base containing information on scholarships, and a more efficient statewide system of processing applications for student loans.

Near-future plans call for the use of FIRN to support a statewide automated library system—LUIS—to promote resource sharing among all public postsecondary education institutions and public libraries. It is anticipated that high schools may also use this service later on. In addition, FIRN will be used to support numerous research projects conducted in the state university system. FIRN is coordinated with other efforts under way in Florida that include the establishment of a satellite network primarily for public education, and other state agencies' data and voice communications networks.

Activities are also underway for students in public schools to utilize the FIRN network to communicate with their peers through the use of the written "electronic" word, for the purpose of expanding their language arts skills. The potential for using the network for downloading instructional software from a central facility to specific schools has also been explored. However, concerns relating to copyright issues have postponed this use of FIRN.

I would like to express my appreciation to Mrs. Jill T. Draper, Research Associate, Florida Department of Education, for her assistance in preparing preliminary FIRN publications from which parts of this paper were derived.

Francis C. Watson

Francis Watson is currently systems development coordinator for the Office of Educational Technology in the Florida Department of Education. He has been involved with the planning and implementation of FIRN from its inception in 1981. Prior to joining Ed Tech, he served as the department's coordinator of Management Information Systems within the Division of Vocational Education. Mr. Watson is often called on to provide technical assistance to school districts, community colleges, and universities, most often in the area of administrative applications utilizing the FIRN network.

Before joining the department, Mr. Watson worked in administrative computing activities at a variety of educational institutions. In 1972 he was awarded the Certificate in Data Processing by the Data Processing Management Association. Mr. Watson is actively involved with various professional associations, including the Florida Association of Educational Data Systems.

New Hampshire: A Case Study

Getting Started in Educational Telecommunications

Molly Watt and Dan Watt

Some Dreams for New Hampshire Educators and Students

Dream #1: Establish a forum or network of forums for New Hampshire educators to exchange ideas, electronic mail, curriculum resources, and technical help. Models are Telecue on CompuServe, the IBM Model Schools Forum on CompuServe, and EMSIE.

Dream #2: Hold a parallel conference via telecommunications for the New Hampshire Association of Computer Education Statewide (NHACES) Annual Conference. This will allow teachers to attend in their own school districts, enabling participation by more than the 300 attendees and cutting down on travel costs. This format is similar to the World Logo Conference on-line, and serves as a model for future state conferences.

Dream #3: Use desktop publishing software, the Apple Macintosh® computer, and a modem to produce the NHACES newsletter, the New Hampshire Association of Computer Coordinators (NHACC) newsletter, and newsletters created by other educational organizations and by students. These can also be made available on-line.

Dream #4: Pilot a program at Thayer High School in Winchester, New Hampshire, to increase cooperation among parents, teachers, and students. Thayer High School was the second school in the nation to join Dr. Theodore Sizer's Coalition for Essential Schools. The predominantly rural, working-class community has the highest dropout rate in the state. In this program 150 microcomputers with modems would be placed in homes to allow students, parents, and teachers to monitor projects and assignments and to communicate with each other. This would create an entirely different relationship between home and school. A homework hotline would allow students to get on-line coaching from teachers and peers in completing homework.

Dream #5: Link science students in a statewide network to monitor and share information on acid rain, perhaps linking up with KIDNET, a network based at Technical Education Research Centers (TERC) in Cambridge, Massachusetts. Students could begin to see themselves as scientists contributing to the data base of information required to make the decisions necessary to preserve life.

Dream #6: Enable New Hampshire students to communicate directly with students in other states and countries as pen pals and on forums. Using as models the World Youth Peace Initiative and the International Penpals Program, this program would extend the educational context for students who have never traveled outside New Hampshire.

Some Facts about New Hampshire

New Hampshire is a rural state with 180,000 students and 58 regional school districts. Schools are generally small and educators are isolated from each other and from immediate access to information, resources, help, and models.

New Hampshire is a comparatively small state in terms of both population and area. This facilitates the project of linking educators and evaluating the effects on schools, learning, and professional development.

New Hampshire Governor John Sununu, a former engineering professor, is aggressively promoting technology in the classroom as a means of upgrading the school system. This approach has put New Hampshire in the public eye as a model for other states.

New Hampshire has organized politically and educationally with a focus on telecommunications as a partial solution to improving educational delivery.

Some Problems to Address

Getting started. This entails having an image of what is possible and what is to be gained.

Getting hardware, including a modem. This requires educating those who write and approve purchase orders.

Choosing software that is inexpensive and easy to use, for communicating with other computers and systems.

Choosing or creating a network, a bulletin board, or data base.

Getting a telephone line to use in school (which turns out to be nontrivial!).

Having a system to help new users through the difficulties once they get on-line, so that they do not become discouraged.

Finding a way to pay the connect-time and long-distance charges. (Most calls to telecommunications nodes in New Hampshire are long-distance.)

Creating enough value to keep users accessing regularly, despite the costs and difficulties involved.

Ensuring equal access to students and teachers, regardless of their socio-economic group or sex.

Gathering Momentum for Telecommunications

1980

Educators created a statewide organization, NHACES, to facilitate leadership, training, and communication about educational computing among teachers and decision makers in order to put appropriate technology in classrooms.

Anne Knight, NHACES president, trained members of the NHACES Board to use the DEC PDP-10 at the University of New Hampshire as a host for electronic mail and communication about educational computing. Most members never accessed the system. (In 1986, three board members used UNH's **VAX** Notes to communicate regularly.)

1985

SpecialNet was placed in each school district so that special ed coordinators could access information and communicate with others.

Monadnock Logo Users, a special-interest group of NHACES, accessed Logo Forums on CompuServe during several meetings. Confer, an MTS system at University of Michigan, was used by members to participate in the Logo Forum and the LIFT network.

Jack Taube gave the dinner speech at the NHACES Annual Meeting, inspiring members with the possibilities for educators to collaborate across distances.

As part of her task when nominated as First Vice President, Molly Watt took on the responsibility of increasing awareness in New Hampshire about the potential of telecommunications for educators.

The NHACES Board cosponsored a local site for the World Logo Conference at Keene State College. The conference at Keene was linked to more than a dozen sites around the world. This pilot project was inspirational to educators across the state.

In October, NHACES supported board member Michael Goldsmith in starting NHACC, a special-interest group that needed a statewide professional network. Telecommunications became one of its first targets of study.

NHACES began to use desktop publishing to produce its quarterly newsletter. PageMaker software was purchased and members began to learn to upload files via modem to the editor's computer. This was a first step toward putting the newsletter itself on-line as part of a statewide telecommunications link-up. NHACC followed suit with its newsletter.

1986

The annual conference presented two sessions using telecommunications: Steve Weisman of Plymouth State College demonstrated SpecialNet, and Watt, Stavely, and Watt presented a session on Telecommunications for Teachers.

Half the board members of the NHACES began using CompuServe for communications on NHACES business.

The Executive Board of NHACES chose telecommunications as its focus for the 1986–87 year. A goal was set to run a parallel telecommunications conference during the annual conference in February, 1987. Cochairpersons were appointed for the parallel conference. Governor John Sununu launched a $5 million initiative focused on technology "to leverage the capacity of teachers as professionals." His program has three target areas: The Gifted and Talented, Computers for Teachers, and Technology in the Classroom. The latter was reported to include telecommunications as part of its original intent. However, Dr. Otis Sproul, the committee chairman, requested proposals for interactive videodisc projects only.

The NHACC sponsored its second workshop, at which Governor Sununu spoke on the Governor's Initiatives for Excellence in Education. The program also included a small-group discussion on telecommunications, and demonstrations by vendors of telecommunications software. Alan November, keynote speaker, invited New Hampshire educators to access the French River Teacher's Center (Massachusetts) bulletin board.

A statewide Educational Telecommunications Planning Group was established. The group, which includes representatives from the Governor's Initiative, the State of New Hampshire, NHACES, NHACC, SpecialNet, the Regional Center for Educational Training, and the French River Teacher's Center, is exploring the feasibility of getting educators across the state on-line. Major questions for the group include defining a purpose for the system and deciding which educators should participate at the start. Anne Knight is exploring ways to cooperate with the Maine Computer Consortium, which now has an electronic bulletin board. She also intends to put together a statewide "dog-and-pony show" to motivate teachers.

NHACC held its third workshop, sponsored by Apple Computer, with a focus on telecommunications integrated into the curriculum. Apple offered computer coordinators and their school districts the chance to apply for Macintosh-based AppleLink license agreements and AppleLink Macintosh bundles "at a considerable discount." Four districts have already made this commitment.

NH Lab Assistance Center, a division of the Northeast Regional Educational Lab, put in place the NH Labnet—a FIDO bulletin board that teachers can access to get up-to-date information on issues, events, and resources, and to communicate with other teachers.

The Annual Meeting of NHACES, offered two workshops: Beginning Telecommunications and Advanced Telecommunications. The keynote address, "Mindlinks," by Molly Watt, will introduce the context for the NHACES focus on telecommunications.

Editor's Update

In their paper, Molly Watt and Dan Watt describe early issues, events, and efforts to establish a telecommunications base in the state of New Hampshire. The Watts' chronology ends in 1986, with their "dreams" for New Hampshire educators and students as yet unfulfilled.

Subsequently, New Hampshire's state education agency installed the EdLink pilot project. With this statewide on-line system, the Watts' dreams are beginning to come true.

Molly Watt and Dan Watt

Molly Watt and Dan Watt are educational consultants, authors, lecturers, and teacher trainers who travel widely in their work, most recently as part of a team delivering four weeks of training and an Apple Lab to educators at the Curriculum and Materials Research and Training Institute and the People's Education Press in Beijing, China.

They work regularly as consultants at the Educational Development Center's Center for Learning Technology. They also share a half-time position as computer coordinator at Thayer High School in Winchester, New Hampshire, in order to stay grounded in the "real world" of students and schools. They are currently co-authoring a handbook on educational telecommunications with Dr. Gerri Sinclair of Simon Fraser University.

Ms. Watt is vice president of NHACES and editor of its quarterly newsletter. She is convenor of the NH Educational Telecommunications Planning Group.

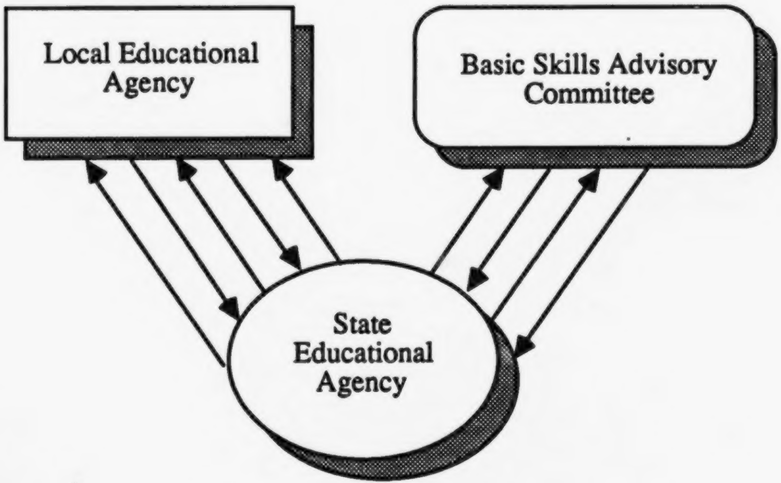
Communications: How AppleLink Improved Apple's Information Flow

Stacey Bressler

Whenever people and information come together there is a potential for communication bottlenecks; and some of the worst possible communication bottlenecks seem to occur in education—perhaps because there is so much information to distribute to so many people!

Two examples of communications "snafus" will be forever etched in my memory. Both occurred at the Department of Education in the state where I resided before coming to California.

The first example involved the process for obtaining approval for a school system's Basic Skills Improvement Plan. Essentially the procedure was that each Local Educational Agency (LEA) received guidelines from the State Educational Agency (SEA). The LEA then submitted a plan, which was read by members of the State Basic Skills Advisory Committee, amended (if necessary) by the LEA, and finally approved by the SEA. While this may sound straightforward, what actually occurred was as follows:



Step 1: The SEA sent guidelines to the LEA.
Step 2: The LEA sent a plan to the SEA.
Step 3: The SEA sent the plan to the Basic Skills Advisory Committee.
Step 4: The Advisory Committee sent the plan back to the SEA with suggestions.
Step 5: The SEA sent the plan and suggestions to the LEA.
Step 6: The LEA sent the amended plan to the SEA.
Step 7: The SEA sent the amended plan to the Basic Skills Advisory Committee.
Step 8: The Advisory Committee sent the amended and approved plan back to the SEA.
Step 9: The SEA notified the LEA of plan approval.

This procedure became increasingly complex if the plan needed more than one round of revision, or the LEA did not get all the necessary signatures, or the advisory committee reader took the plan away with him/her on vacation, or any of a hundred other disasters occurred. Since all communications were done by mail, the average approval process took three to six months. Imagine repeating this process for more than 350 LEAs!

But even a Basic Skills plan approval process could not compare with the following (true) story involving a woman who needed accreditation as a school librarian.

> In May the woman, who was already a certified teacher in another state, completed her master's degree in library science and sent a request for information to the Teacher Certification Bureau.
>
> In July she received a letter from the Teacher Certification Bureau that included the requirements for the certification she was seeking. She immediately sent in the necessary paperwork.
>
> In August she was offered a school librarian position, contingent upon receiving state certification. She tried telephoning the Teacher Certification Bureau, but was greeted by a recorded announcement explaining that the bureau was not able to accept phone calls because of the volume and that all communications should be by mail. In desperation, she sent off a telegram requesting immediate action on her certification request.

In September she received a temporary certification (supposedly good for six months) and an appointment for an interview in October. While driving to her appointment in October, she was delayed by a major traffic jam and arrived at the Teacher Certification Bureau five minutes after the offices had closed for the day. She tried to telephone the next morning to explain why she had missed her appointment, but she once again encountered the recorded message. She sent a telegram.

In November she received a letter with a new appointment date in late January. In January she finally had a face-to-face meeting and was informed that one of her undergraduate courses in education might not be appropriate for meeting certification requirements. She agreed to supply additional information about the course in question.

In February she sent in the required information to the Teacher Certification Bureau by registered letter.

In March she received notification from the Teacher Certification Bureau that the requirements for certification as a school librarian were being amended and that only those having valid certification by the following September would be grandfathered. She answered this with a postcard reminding the bureau that she was still awaiting her certification approval.

On the last day of April she received a devastating letter from the Teacher Certification Bureau that her paperwork had been lost. She was instructed to supply new copies of the information as soon as possible. Feeling pleased that she had made xerox copies of everything she had submitted, she promptly sent in the copies.

In June she was informed that xerox copies were not acceptable, and that she would need signed originals of the transcripts from her undergraduate and graduate education. Fortunately she was able to obtain this paperwork quickly (the schools were within driving distance) and the new paperwork was submitted before the end of July. In the same letter, she requested an appointment to expedite receipt of her certification.

> In early August she received a letter indicating an appointment date in late August. At this appointment she was told by a new administrator that more information would be needed about one of her graduate courses before certification would be granted.
>
> The woman finally received her certification in November—two months after the deadline for being grandfathered under the existing certification requirements. Not only had it taken 18 months to receive certification, but she now had 34 months to take two courses and reapply for certification under the new program!

In 1982 when I came to Apple, I thought I had left this sort of communication problem behind me. While nothing can ever compare to the information "flow" of the State Department of Education, I learned that even one of America's fastest-growing companies can have its share of communication problems.

Apple creates new programs, promotions, policies, products, and pricing that need to be communicated on a regular basis to field salespeople, managers, and a nationwide network of independent dealers. And until quite recently, most of this information was communicated via telephone, U.S. Postal Service, or Federal Express. This led to critical delays and miscommunication.

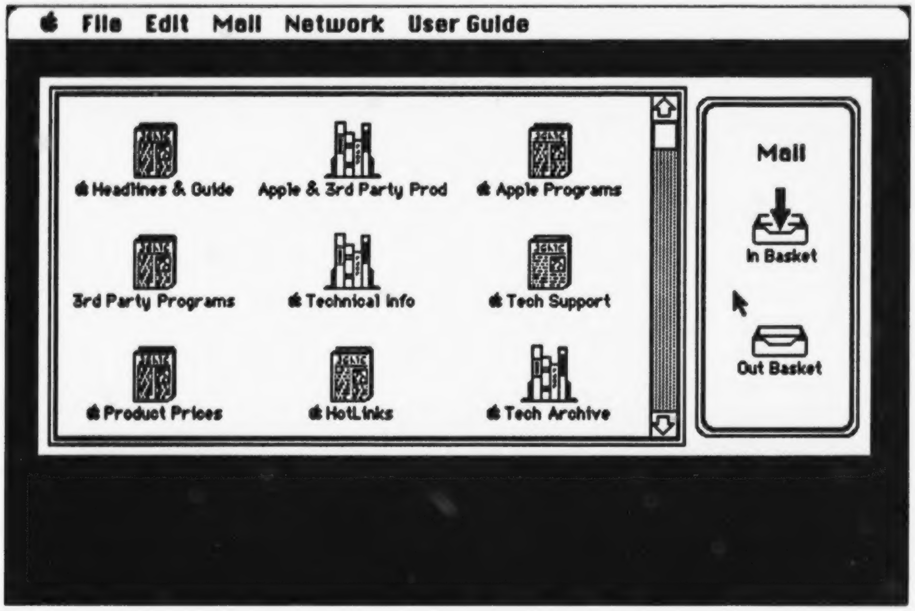
Then came AppleLink. In 1984, Apple and the General Electric Information Services Company (GEISCO) signed an agreement to develop the AppleLink communications system. The system was designed to provide technical support and program information to Apple's dealers and field sales personnel and to allow these people to be up and running on the system in minutes *with little or no additional training!*

Late in the spring of 1985, AppleLink went into a pilot program. Before the end of that summer, we knew that our system had surpassed our expectations. Not only did the system greatly improve technical support, but the electronic mail component completely revolutionized the way we conduct our business. Field personnel found that being freed from the constraints of time zone differences and "telephone tag" increased communications with home office personnel and made them far more productive. The psychological effect of knowing that the home office was only a link away was a powerful motivator for both Apple employees and dealers.

At present approximately 10,000 people are using AppleLink's electronic mail, bulletin boards, and data base. The real beauty of the system is that it is extremely powerful but unbelievably simple to use.

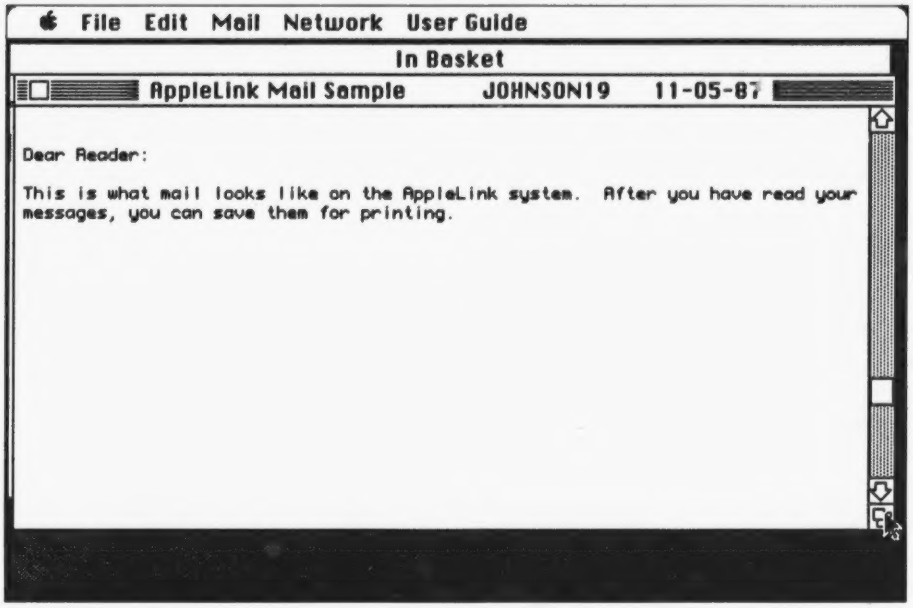
The following pages show how AppleLink looks to the user. The first screen shows the AppleLink desktop, which contains mail, bulletin boards, and libraries (see Figure 1). Notice that the Mail In Basket has an arrow, indicating that there are messages waiting to be read.

Figure 1


File
Edit
Mail
Network
User Guide
Headlines & Guide
Apple & 3rd Party Prod
Apple Programs
3rd Party Programs
Technical Info
Tech Support
Product Prices
HotLinks
Tech Archive
Mail
In Basket
Out Basket

To read the mail in the box, the user points to the In Basket with the cursor and clicks twice on the mouse button. The screen shows a list of incoming mail. The user points to the message he or she wants to read and clicks twice on the mouse button. The message appears, as illustrated in Figure 2.

Figure 2


File
Edit
Mail
Network
User Guide
In Basket
AppleLink Mail Sample
JOHNSON19
11-05-87

Dear Reader:

This is what mail looks like on the AppleLink system. After you have read your messages, you can save them for printing.

If an Alert icon appears in the list of mail, this indicates that AppleLink contains an important, time-sensitive message. To read the Alert message, the user points to the icon and clicks twice on the mouse button.

Bulletin boards, such as Headlines & Guide (Figure 3), may contain different types of information. Headlines & Guide includes documents (Figure 4) and folders containing related documents (Figure 5). As you would expect, information is read by pointing the cursor to the icon of the document or folder you wish to open and then double-clicking.

Figure 3

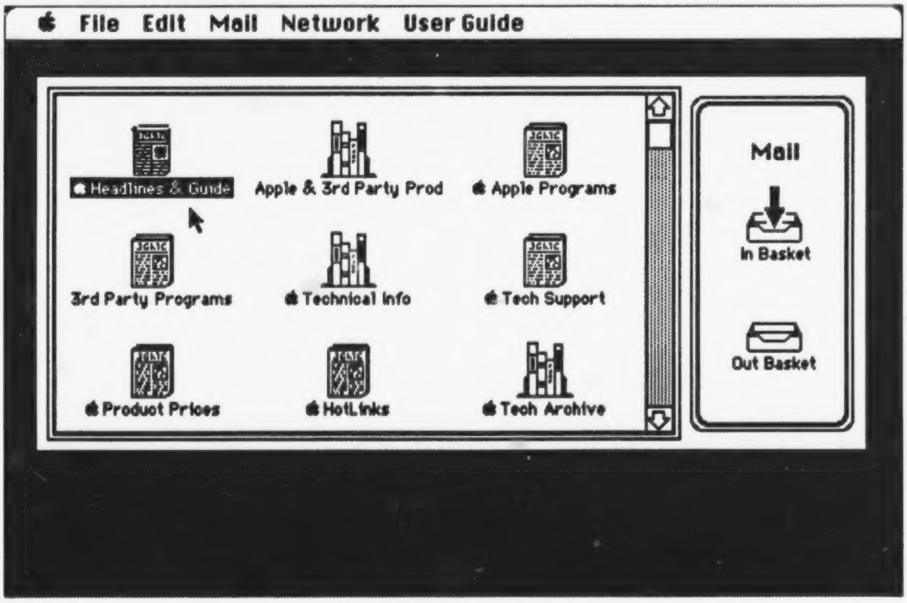
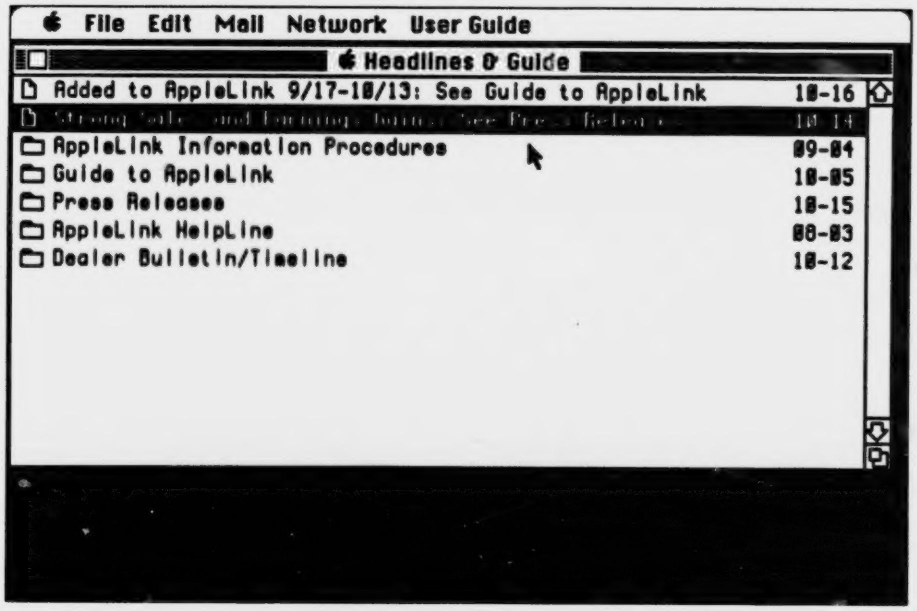
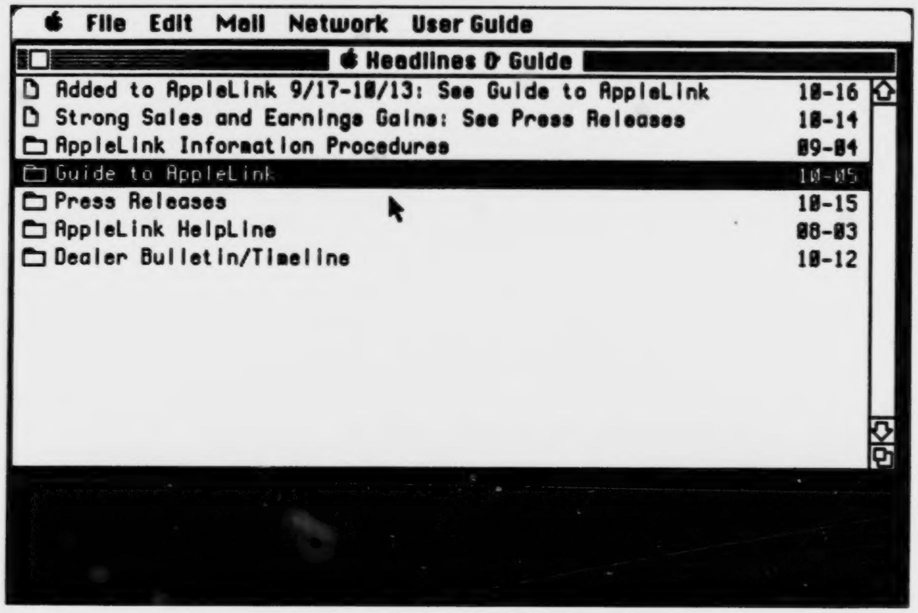

File
Edit
Mail
Network
User Guide
Headlines & Guide
Apple & 3rd Party Prod
Apple Programs
3rd Party Programs
Technical Info
Tech Support
Product Prices
HotLinks
Tech Archive
Mail
In Basket
Out Basket

Figure 4


File
Edit
Mail
Network
User Guide
Headlines & Guide

Added to AppleLink 9/17-10/13: See Guide to AppleLink 10-16
Strong Sales and Earnings Gains: See Press Releases 10-14
AppleLink Information Procedures 09-04
Guide to AppleLink 10-05
Press Releases 10-15
AppleLink HelpLine 08-03
Dealer Bulletin/Timeline 10-12

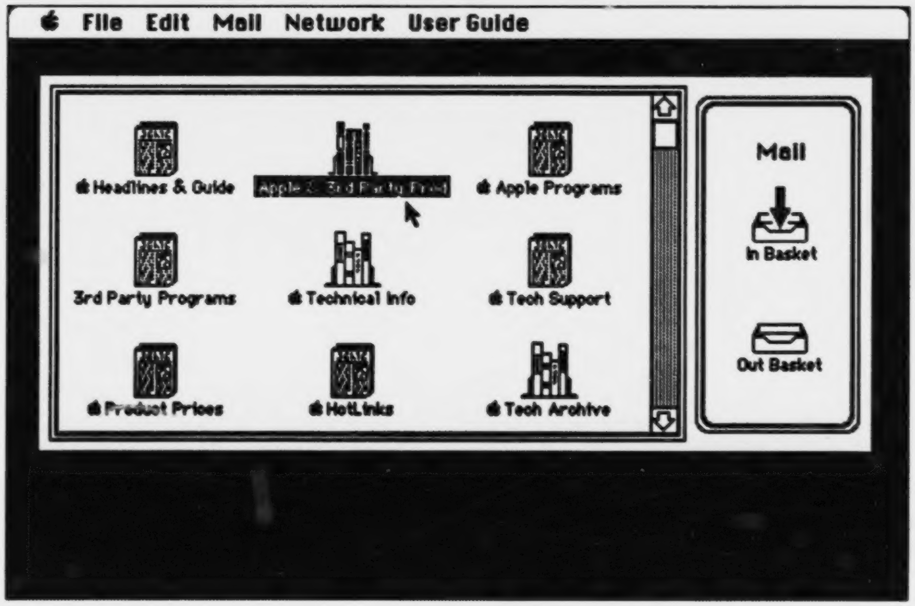
Figure 5


File
Edit
Mail
Network
User Guide
Headlines & Guide

Added to AppleLink 9/17-10/13: See Guide to AppleLink 10-16
Strong Sales and Earnings Gains: See Press Releases 10-14
AppleLink Information Procedures 09-04
Guide to AppleLink 10-05
Press Releases 10-15
AppleLink HelpLine 08-03
Dealer Bulletin/Timeline 10-12

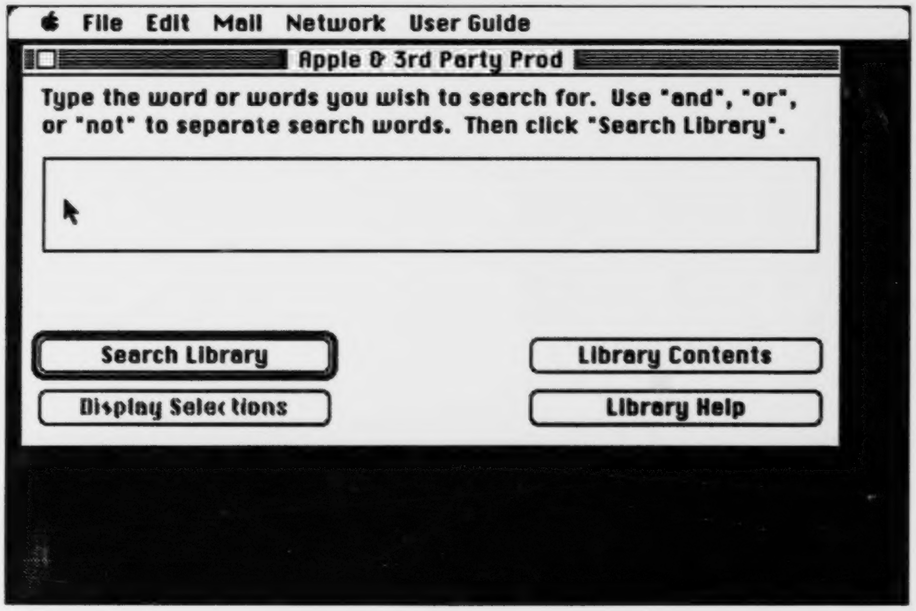
One of the most important features of AppleLink is access to Apple's technical and marketing data base, which is done through the libraries. In the examples that follow, the user is seeking information on communications software for the Macintosh. First the user clicks twice on a library icon—in this example, Apple & 3rd Party Products (Figure 6).

Figure 6


File
Edit
Mail
Network
User Guide
Headlines & Guide
Apple & 3rd Party Prod
Apple Programs
3rd Party Programs
Technical Info
Tech Support
Product Prices
HotLinks
Tech Archive
Mail
In Basket
Out Basket

The user is then instructed to enter words for a search (Figure 7). Since the data base is able to search *every word in every document*, the user does not have to remember special titles or descriptors.

Figure 7



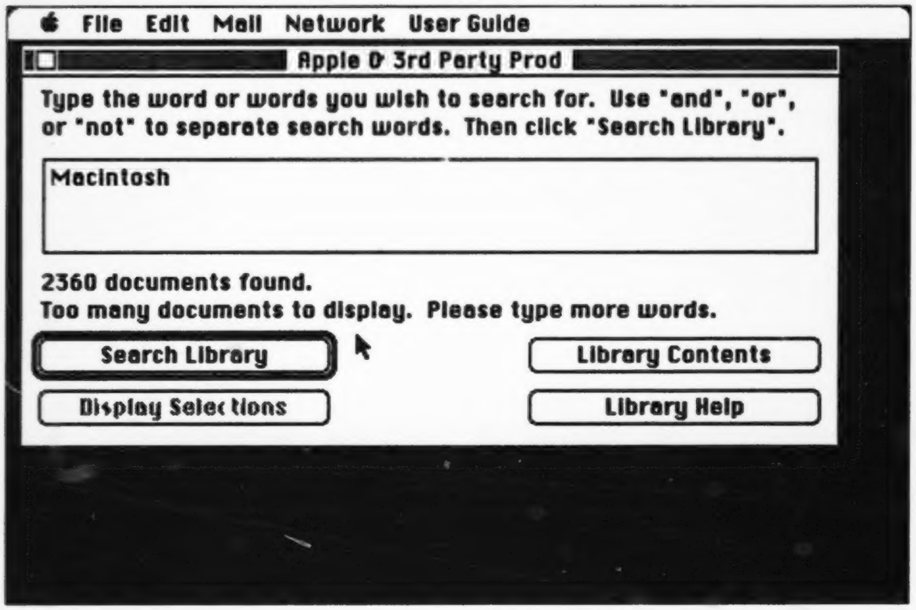
File
Edit
Mail
Network
User Guide
Apple & 3rd Party Prod

Type the word or words you wish to search for. Use "and", "or", or "not" to separate search words. Then click "Search Library".

Search Library
Library Contents
Display Selections
Library Help

In our example, the user types the word *Macintosh*. The search is conducted, and the screen shows that the name *Macintosh* is included in 2360 documents. The user is instructed to qualify the search further (Figure 8).

Figure 8


File Edit Mail Network User Guide
Apple & 3rd Party Prod
Search Library
Library Contents
Display Selections
Library Help

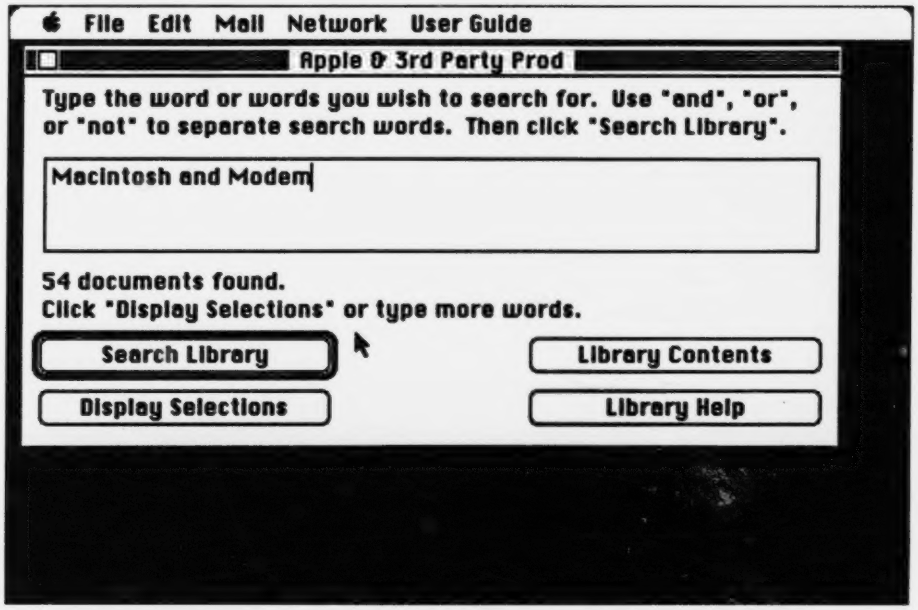
Type the word or words you wish to search for. Use "and", "or", or "not" to separate search words. Then click "Search Library".

Macintosh

2360 documents found.
Too many documents to display. Please type more words.

Figures 9 and 10 illustrate how easily options are narrowed in locating information. First the user limits the search to "Macintosh and Modem," and then to "Macintosh and Modem and Software."

Figure 9

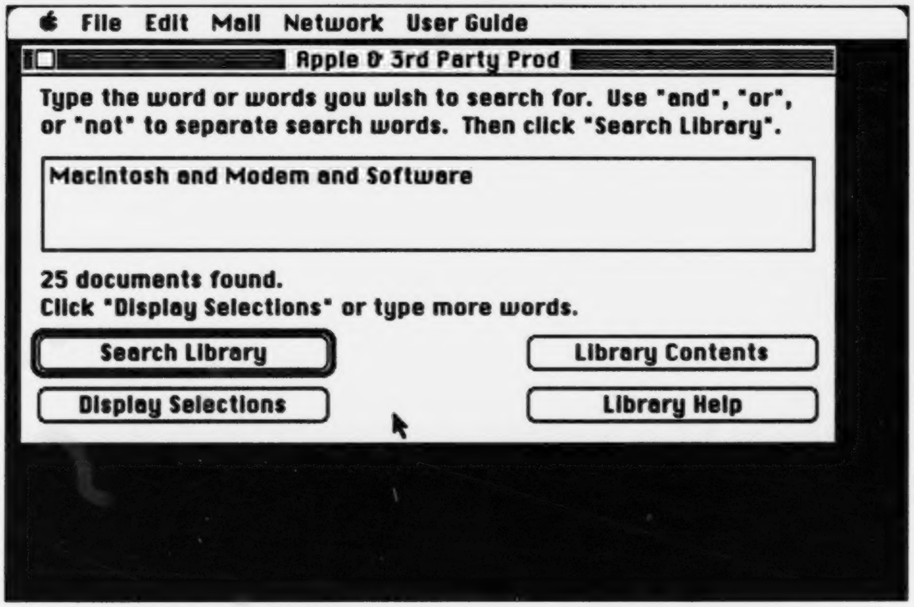

File
Edit
Mail
Network
User Guide
Apple & 3rd Party Prod
Search Library
Library Contents
Display Selections
Library Help

Type the word or words you wish to search for. Use "and", "or", or "not" to separate search words. Then click "Search Library".

Macintosh and Modem

54 documents found.
Click "Display Selections" or type more words.

Figure 10


File
Edit
Mail
Network
User Guide
Apple & 3rd Party Prod
Search Library
Library Contents
Display Selections
Library Help

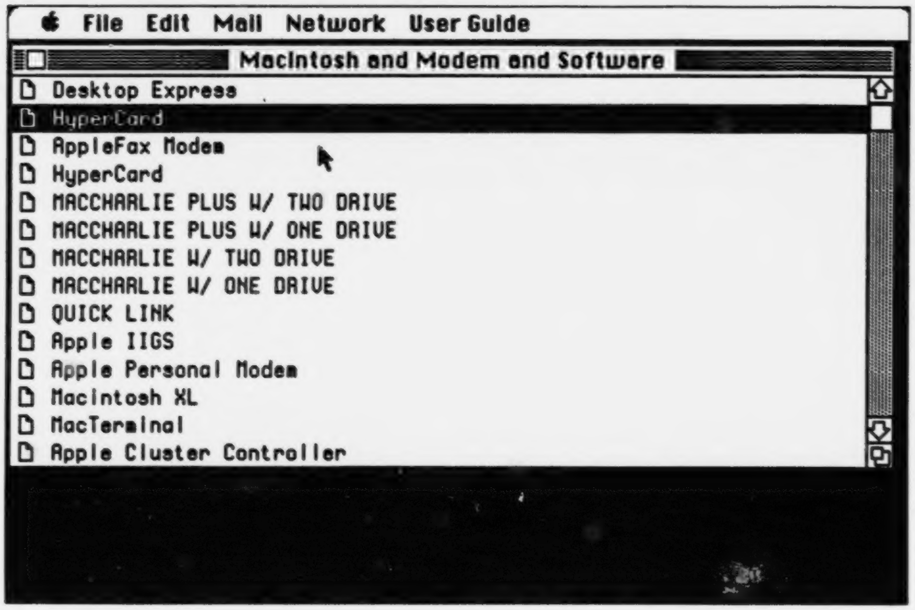
Type the word or words you wish to search for. Use "and", "or", or "not" to separate search words. Then click "Search Library".

Macintosh and Modem and Software

25 documents found.
Click "Display Selections" or type more words.

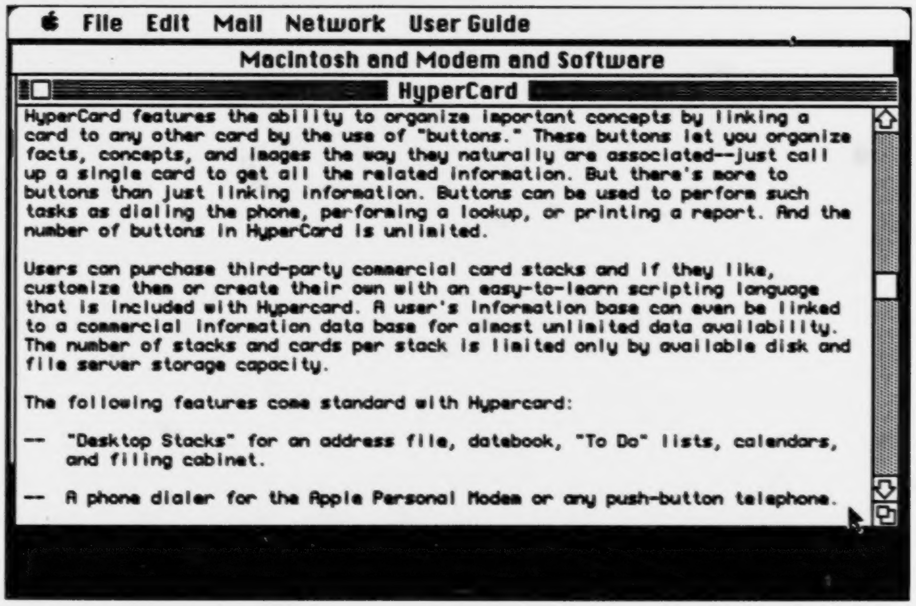
Once a reasonable number of documents is offered, the user points to "Display Selections" and double-clicks to see a listing of the titles (Figure 11). The selection process is repeated to open the selected document (Figure 12).

Figure 11


File
Edit
Mail
Network
User Guide
Macintosh and Modem and Software

Desktop Express
HyperCard
AppleFax Modem
HyperCard
MACCHARLIE PLUS W/ TWO DRIVE
MACCHARLIE PLUS W/ ONE DRIVE
MACCHARLIE W/ TWO DRIVE
MACCHARLIE W/ ONE DRIVE
QUICK LINK
Apple IIGS
Apple Personal Modem
Macintosh XL
MacTerminal
Apple Cluster Controller

Figure 12



HyperCard features the ability to organize important concepts by linking a card to any other card by the use of "buttons." These buttons let you organize facts, concepts, and images the way they naturally are associated--just call up a single card to get all the related information. But there's more to buttons than just linking information. Buttons can be used to perform such tasks as dialing the phone, performing a lookup, or printing a report. And the number of buttons in HyperCard is unlimited.

Users can purchase third-party commercial card stacks and if they like, customize them or create their own with an easy-to-learn scripting language that is included with Hypercard. A user's information base can even be linked to a commercial information data base for almost unlimited data availability. The number of stacks and cards per stack is limited only by available disk and file server storage capacity.

The following features come standard with Hypercard:

-- "Desktop Stacks" for an address file, datebook, "To Do" lists, calendars, and filing cabinet.

-- A phone dialer for the Apple Personal Modem or any push-button telephone.

The AppleLink system really has helped Apple employees and dealers navigate their way through a sea of information. AppleLink's functionality and ease of use have made the system indispensable.

I often think about how much AppleLink could do for education.

If the Department of Education I mentioned earlier had only had AppleLink, the Basic Skills approval process could have been accomplished in at least one-third less time through the electronic transfer of documents. And if teacher certification requirements and questions could be accessed on-line, the process might even work efficiently.

Apple is interested in the application of a similar system in education. Through the Education Advisory Council and other forums, we hope to learn how the process of education can be made most efficient through the use of electronic networking.

Stacey Bressler

Stacey Bressler is currently manager of customer support programs with NeXt, Inc. Previously she worked as project manager in strategic sales for Apple Computer, where she participated in the design and implementation of the Apple University Consortium.

Before her experience at Apple, Ms. Bressler served as coordinator of instructional technology and basic skills for the Massachusetts Department of Education, and as coordinator of training for Massachusetts Educational Television.

As a consultant in instructional technology, she worked with WNET in New York, WGBH Radio in Boston, the Gutman Library of Harvard University, and the Public Broadcasting Service in Washington, D.C., among others. She holds an M.S. from Simmons College Graduate School of Library and Information Science.

Superintendents at the Workstation?

Larry Vaughan

What's the job of school superintendent really like? Well, we know it's not an easy job. There is a large volume of information both coming and going; there are many decisions to be made; and there is that all-important job of providing the kind of leadership for curriculum and instruction that can maximize student learning.

Peter Drucker has said, "If the computer doesn't enable us to simplify our organizations, it's being abused." Can an electronic network for educators simplify our educational organizations? Will the power of the computer provide enough of an increase in efficiency and effectiveness to lure the busy superintendent to the workstation? What kinds of information should be put on a network for school superintendents and other administrators? How should it be organized? What information processing tools will superintendents need to learn to use in order to utilize a network effectively?

These and many other questions have arisen. Several groups across the nation are pondering the utility of electronic communications for presenting solutions to education problems. Others are wondering if education presents a "real" market for electronic information services and products or just another risky venture into a national market that lacks a national-level organizational structure.

All this pondering has led groups to conceptualize, configure, and pilot electronic networks for educators. I am pleased to observe that the recent pilot networks with which I have firsthand experience have a great deal of potential for presenting solutions to many persistent educational communication problems. This potential should be particularly important to superintendents who, studies suggest, devote approximately 40 percent of their contact time exclusively to the transmisson of information.

AppleLink has much promise for educators. AppleLink was developed by Apple and the General Electric Information Services Corporation (GEISCO) in order to solve Apple's internal communication problems. It has many versatile features such as searchable data bases called libraries, one-way bulletin boards organized hierarchically, two-way interactive bulletin boards where users can add their own messages to existing topic-specific files, and single or multiple addressee electronic mail. AppleLink is accessed via modem, and the system is operated on a large mainframe computer by GEISCO. I won't describe the "look and feel" of AppleLink since those details are available elsewhere in this publication (see Bressler).

By all accounts I've heard, AppleLink has served Apple very well since its initial implementation in the spring of 1985. It was specifically designed to accommodate multiple levels of communication needs typical to a large corporation like Apple, with many employees spread across several divisions, and thousands of dealers across the world. AppleLink is a full-service information utility with a complex structure of interlocking information services that allow point-to-point and point-to-multipoint communications.

Yet this complexity is not apparent to the user. In fact, I personally know more than a dozen education professionals who learned to use AppleLink successfully in less than one hour in spite of the fact that they were not previously considered computer users. Also, I know more than 20 superintendents who regularly communicate with one another, send multiaddressee electronic mail, upload and download material from bulletin boards, and so on. These education professionals were part of a pilot joint venture among Apple, GEISCO, and the office of New Hampshire Governor's Excellence Initiative. This pilot was called EdLink.

We learned much through the pilot project; early in the game we knew we would not be willing to give it up after the pilot phase. Superintendents accessed EdLink approximately four times per week during the pilot project. While some bulletin board applications were popular, the most frequently used features were single-point and multipoint electronic mail. The content of communications varied widely, but most of it had to do with gaining rapid access to the experience and perspective of one's peers regarding how to handle particular problems. A few superintendents seemed to be almost addicted to this new information utility, with average access of more than twice daily. Conversely, a few pilot participants used EdLink only once or twice per week. More than once, a frustrated administrator had to telephone peers to tell them to read their electronic mail. Such variation in use is typical of new systems.

Perhaps the most important lesson from EdLink is that people will employ and value a powerful communication tool if it is easy to use. I've been part of other less successful pilot projects in which educators were expected to learn to branch across several command levels, each with a unique set of commands, before they could read or send a message. Busy administrators in any profession want tools that make their work more efficient and effective, but they don't want to memorize hundreds of commands to gain this efficiency. That's the beauty of AppleLink—it's easy to learn and use. Yet it is multifaceted and powerful.

A flexible information utility like AppleLink could be adapted to fit the communication needs of an educational organization of any size. The New Hampshire EdLink system was designed for statewide application. Participants included the commissioner and several staff members of the State Department of Education, superintendents, a few business administrators, computer coordinators, the office of the Governor's Initiative, and other selected educators. The main features of this system included:

- A one-way bulletin board on the state's education regulations
- A two-way bulletin board for users to post messages of interest to a variety of groups (superintendents, Governor's Initiative staff, computer coordinators, and so on)
- A variety of Apple-oriented data bases and bulletin boards
- Electronic mail

With the exception of the state regulations bulletin board, these features were used frequently. Press releases were posted by the State Department of Education on the two-way bulletin board. The commissioner's office and staff of the State Department of Education frequently used point-to-multipoint electronic mail. They could write one message and simultaneously send it to a whole class of users (for example, superintendents, computer coordinators, every user in the state). Since each user maintains an address book on AppleLink software, it is easy to set up group addresses that can be used many times.

Superintendents and other staff members of local school districts used the electronic mail features frequently. They also made good use of the group address functions. A superintendent could send a message to everyone on the system by simply addressing the memo to "$EDLINK." Here are some examples:

- One superintendent started his own forum on a set of proposed federal regulations by sending a one-page memo to all superintendents and inviting response.
- Most superintendents sent group links to their peers asking advice on how to handle a particular issue.

- Several superintendents advertised to fill teaching or administrative vacancies.

- Superintendents requested data and/or documents about particular curriculum issues.

Like other means of communication, EdLink brings like-minded persons together. Some superintendents used EdLink frequently to participate in regional superintendent group discussions. Others sought out frequent communications with superintendents whose districts were similar to their own in size, location, tax base, and the like.

Many of the superintendents used EdLink to report to the State Department of Education. Several of the standard state forms were developed as blank "shells" on Microsoft Excel. Superintendents could download the shell from a bulletin board, enter relevant data, and link the information directly to the State Department of Education in a format exactly like that of the printed state form. Also, surveys were developed and sent to local addresses as disk files. These were filled out and returned as the state reporting forms were.

Spinoffs of the EdLink experience started occurring midway through the pilot phase. Some of the larger districts have obtained addresses for all school principals so they can communicate with the central office and quickly move information back and forth. Special-interest groups have formed around topics like business administration, computer use, and selected curriculum issues. EdLink has already influenced the current reorganization of functions within the State Department of Education regarding roles that involve information dissemination to the field. In the future we expect a school principals' forum to develop on the two-way bulletin board, and much more traffic because there will be more users.

As one would expect, when you teach people to use a powerful tool like the Macintosh for communications, they tend to discover other uses for the computer. Most of the superintendents in the pilot also regularly use word processing and graphics programs. Many learned to use Microsoft Excel to prepare district budgets and charts and graphs to use in presentations for the local school board and the public. Some have discovered the wonders of desktop publishing; and since they already have modems, some have reached out to other on-line resource bases and information utilities.

So what's next? What do I recommend on the basis of experience? Well, AppleLink has many good features. Because it is so easy to learn and use, it is feasible to design a customized system of communication without leaving out any education practitioner. The EdLink experience has demonstrated that statewide systems work. Today there are well over 1,000 educators who are regular users of AppleLink, and these include several districtwide installations. And there are obvious implications for more nationally oriented educational communication services via something like AppleLink.

AppleLink was designed to run on the Macintosh computer. Recently Apple has released software that enables Apple II family computers to access this communications utility. The new version was designed to have the "look and feel" of AppleWorks®, using a desktop metaphor.

There are a number of decisions to consider. Costs are one decision point that seems to favor AppleLink because, unlike other information utilities, AppleLink enables users to prepare messages off-line easily and send/receive information quickly, thus minimizing connect charges. However, I think the most important business decision is an old familiar one: "buy or rent." New networking products are entering the marketplace—even some that operate in the friendly Macintosh environment. So some groups may wish to consider whether they should set up their own local or regional educational network. There are many trade-offs buried in this decision.

The future holds much promise for those groups of educators who value communication with their peers and access to resource bases. To me, the most important issue is: Will the intended users actually use the system you choose? If users don't see the benefits or find the system hard to use, then communication problems will persist in spite of resource investment.

Larry Vaughan

Larry Vaughan is an independent consultant who has done a great deal of work on technological applications to education. During his career he has worked for various nonprofit educational service agencies. He has been involved with computer instruction for about 20 years, beginning in graduate school with evaluation studies of the "Talking Typewriter." At the University of Pittsburgh's Learning Research and Development Center, he worked extensively with the Experimental Time Sharing System, conducting research on software applications for elementary school teachers and students.

During the last five years, Mr. Vaughan has concentrated on helping schools understand the power of technology to produce solutions to their most pressing problems. Part of his work has been encouraging schools to make effective use of instructional technology in curriculum areas. He has coordinated several regional computer instruction conferences, convened educational *technology task forces, and produced and edited a number of resource books for educators, including:*

- Technology Programs that Work
- Evaluation of Educational Software: A Guide to Guides
- Computers in the Classroom: Experiences Teaching with Flexible Tools

Mr. Vaughan was the executive producer of "Computers in Education: A Mid-Eighties View," a series of three 90-minute video programs broadcast via satellite to a nationwide audience. Also, he developed an electronic newsletter called TECH TALK for educators on The Source. Mr. Vaughan's most recent work has concentrated on promoting the use of tool software in classrooms and other educational settings.

METN: Networking in Maryland

Michael F. Sullivan

The Maryland Education Technology Network (METN) began as a response to local school districts' requests for assistance from the State Department of Education in the area of instructional computing. At that time Maryland was not unlike most states in that various districts had adopted different philosophies of instructional computing, often fundamentally at odds with one another. At that time even the selection of a particular brand name was a statement of belief.

One difference between Maryland and most other reasonably affluent states was that Maryland schools had not purchased large numbers of computers during this earliest phase of the computer revolution, and consequently, most districts did not feel a great need to defend their particular philosophy or brand name choice. The districts were willing to consider novel and untried approaches to the instructional computing issue.

When the State Superintendent of Schools, David W. Hornbeck, appointed a task force to examine the issue of instructional computing, he insisted only that it focus on the state's role in providing for equity for all of Maryland's students. Equity was a critical factor because even in the early 1980s there were extreme differences based on wealth in the availability of computers among districts.

This task force made the usual statements about computer literacy and teacher certification, but it also emphasized that the state should accept responsibility for designing a fair and equitable approach to instructional computing for the entire state. Hence METN was born.

The assignment to create METN went to the Division of Instructional Television. In the Department of Education, MITV, as it was known, was the division that had coordinated all video services to schools and had a history of providing quality services on an equitable basis. MITV also had a philosophy that communication was the keystone of education. This philosophy had resulted in numerous projects extending far beyond the traditional ITV service.

Because of this beginning, METN from its start was a project based more on communications than on computing. While the power of computing certainly was not lost on those assigned to the project, they paid much attention to the limitations of the personal computer in an instructional setting. These devices, which were so helpful in finding answers, were of little apparent value in learning procedures or developing skills; and they were of absolutely no use in supporting communications. Often computers were used in such a way as to inhibit communications. (I will resist the temptation to tell about the teacher who held the floppy disk up to the light.)

Certainly it was well known that the computer was potentially a powerful communications device and the technology existed to make it function in meaningful ways, but both education and industry seemed content to use computers as very expensive drill and practice workbooks. It became the goal of METN to create a new philosophy of instructional computing based on communications, economy, and equity.

The first step in this process was to define the system that would support such an ambitious undertaking. METN developed an extensive document which, among other things, called for local area networks in classrooms with 512K student workstations operating in a UNIX® environment. This occurred in an age when many were questioning if public education would give up 16K machines for the new 64K machines!

The LAN and sophisticated workstations were not the object of METN—they were the means. One other critical objective was a communications capacity that would permit each student to hear, see, and exchange information throughout the world. Of course, the overriding concern for equity and economy did not permit dependence on modems and telephone lines, so the specification called for a system of point-to-multipoint communications using the broadcast capacity of Maryland Public Television.

The process of implementing METN was most difficult. Computer manufacturers had little interest in developing this (then) extremely powerful workstation for an industry satisfied with existing products. Communications firms were unable to develop needed products at rates education could afford.

The answer was found in compromise. The first installation consisted of 128K computers connected to an external LAN. Communication was modem-based. The system was bulky, difficult to operate, and too expensive for most districts. In other words, it did not address the basic criteria of the project. It did, however, make a statement. It said that educators were serious about exploring new technology. It said that more powerful technology had a place in the classroom, and that the state was serious about driving industry to offer education the same sophistication it was offering to the private sector.

By the end of 1986, METN supported classrooms with 512K workstations, built-in LANs, and a UNIX-like operating system. Software and other digital information had been broadcast over the television signal. Finance plans had been developed to make it possible for even the poorest district to participate in the network.

Our lessons in METN taught us many things:

1. To bring about meaningful change you must challenge current wisdom.

2. Technology is capable of nearly anything.

3. It is better to do something poorly than to do nothing at all.

4. Educators can be brought together to work for a common good.

Today Maryland is one member of a multistate and multiprovince consortium that has goals similar to those of METN. The Software Communications Service (SCS) brings together a large number of educators who see an unfulfilled promise in educational technology. METN should soon be the beneficiary of a large-scale movement to improve education through the most sophisticated forms of communication and computing available.

Editor's Update

Under Mike Sullivan, former assistant state superintendent and director of the METN project, METN's goals emphasized communications, which relied to some degree on the MITV capability of broadcasting courseware and facilitating data-base access. Discussions with the current director of METN, Dr. Frank Windsor, indicate that the METN project involves primarily 30 local area network configurations operated in 30 schools throughout the state. While METN has demonstrated the technical feasibility of broadcasting software programs to individual sites, it has not been economically feasible to broadcast large packages, especially to a limited number of sites. On the other hand, several METN sites have been using the local area networks for telecomputing, particularly to access on-line data bases such as Addison-Wesley's Einstein, whose predecessor—Express—was partially developed by a group in Queen Anne's County. This group is also experimenting with CD-ROM programs (particularly an "electronic encyclopedia") on the local area network.

In addition to those noted by Sullivan, several other factors contributed to the success of METN, including:

- Leaders at individual demonstration sites who took advantage of the policies and facilitating role of the state department (for example, by obtaining initial equipment on a loan basis from IBM and CEMCORP).

- Initial and expanded in-service training for district staff, including network operators and teachers.

- Demonstrations in naturalistic settings that were critical to the adoption of the program by other sites during the last six months (increasing the number of sites from fewer than 10 to 30).

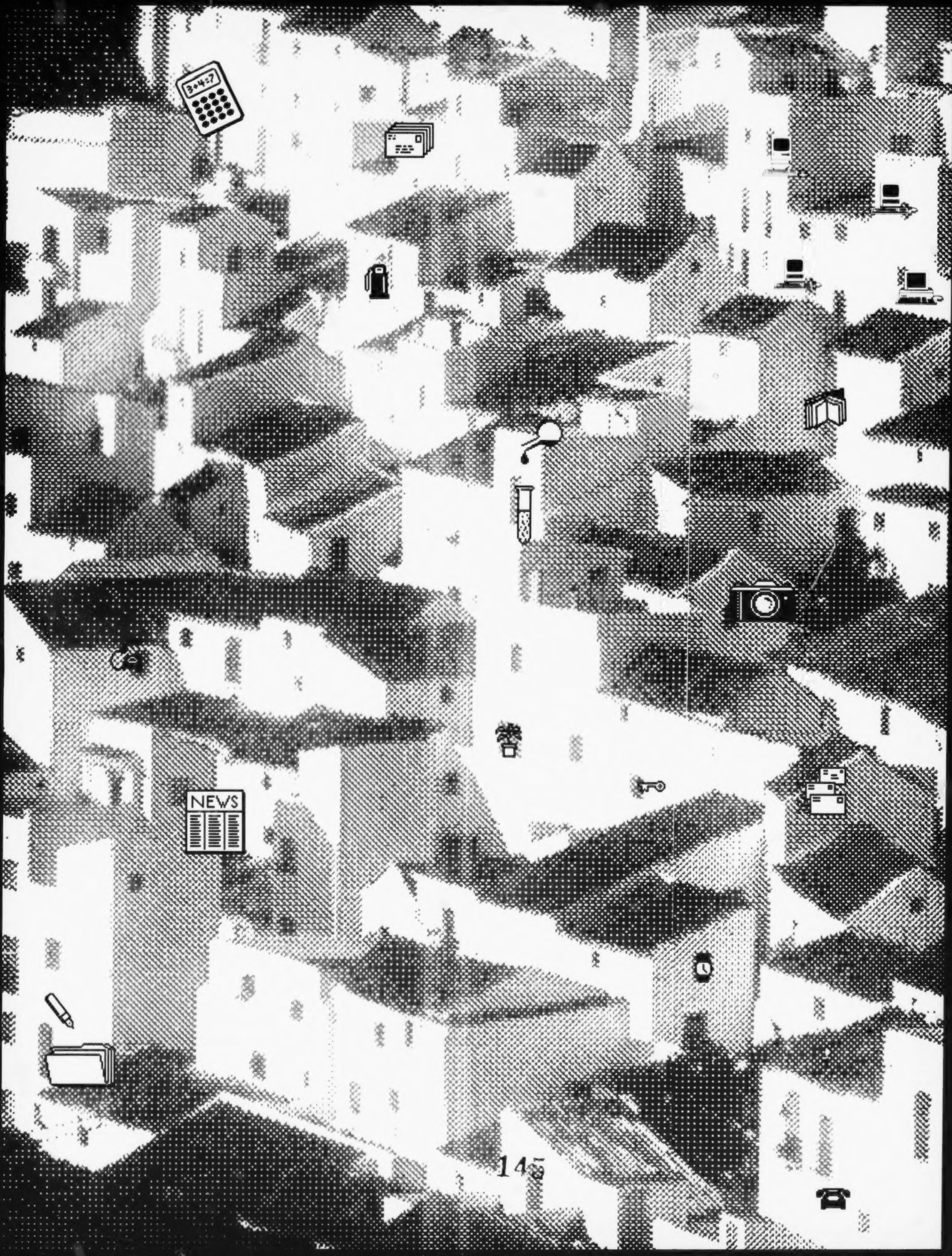
- Initial cooperation and professional collaboration between METN staff, local staff, hardware vendors, and third-party software publishers.

- Opportunities and encouragement for experimentation with different configurations, approaches, and applications at the various sites.

Michael F. Sullivan

Mike Sullivan is currently senior regional education consultant with UNISYS Corporation. Prior to accepting this position, he was assistant state superintendent of schools in Maryland, where he was responsible for instructional technology, including the Maryland Educational Technology Network (METN).

Mr. Sullivan has worked as a teacher, school administrator, district supervisor, curriculum specialist, and university instructor at different times during his 20-year career in education. He practices his theories on his three children at home in Maryland.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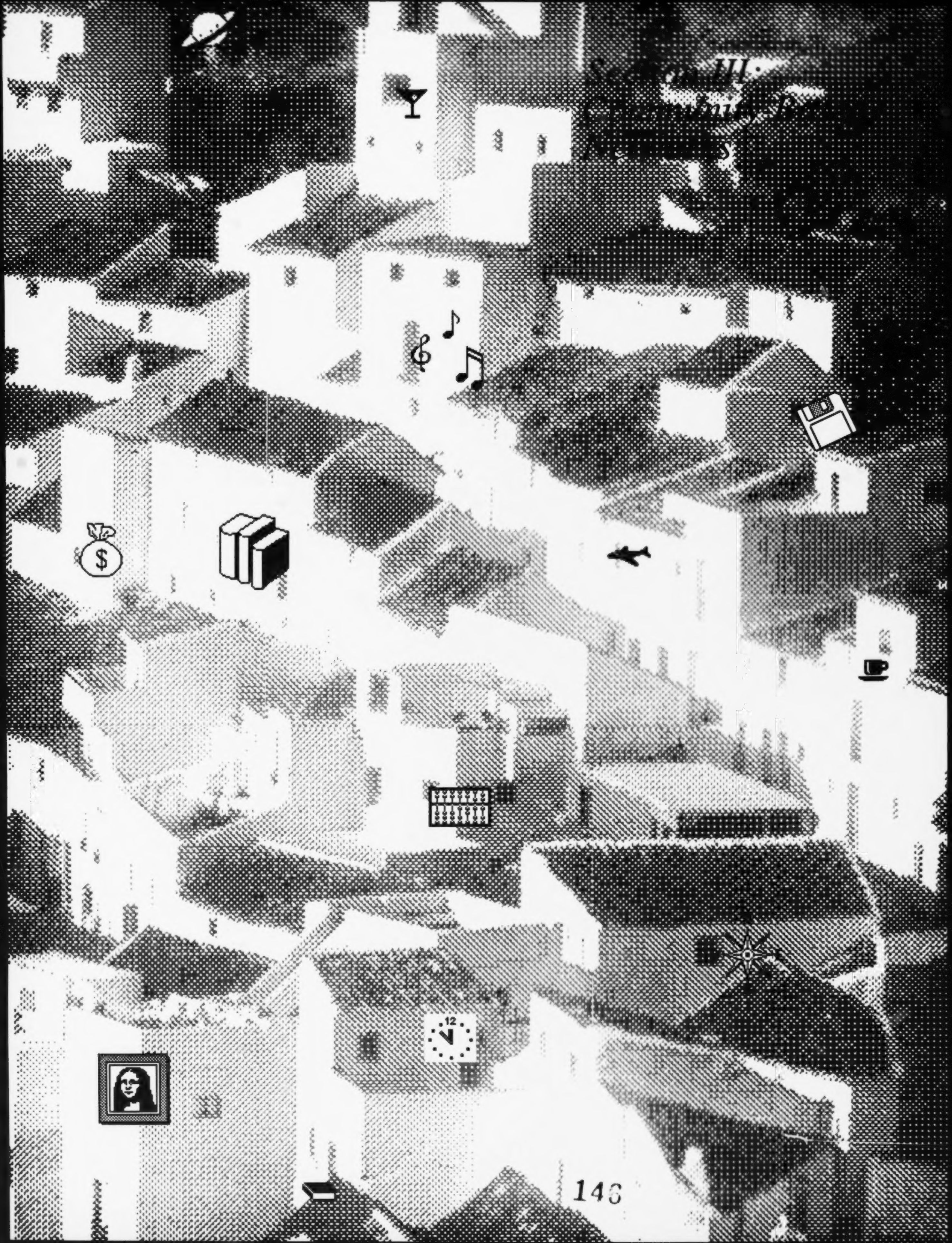


Section III:
Community [illegible]
Resources

Community-Based Networks

In this category are several examples of projects with local "grass roots" origins—projects initiated to answer a specific local communications challenge. These projects typically serve students and teachers more than administrators, enabling information flow among teachers and students in classes, on bulletin boards, or one-on-one. Many successful programs of this type are in operation throughout the country. This section offers a glimpse of the possibilities afforded by telecommunications solutions.

Robert Spielvogel discusses Learning Link, WNET's computer-based network of information services for educators. The project began as an attempt to fill the need for more efficient transfer of WNET's educational program schedule, and has grown to include a variety of community services. The present subscriber base is composed of schools within the WNET broadcast area. Soon, WNET will offer help to other public broadcasting channels and state departments of education to establish similar services in their own areas.

Al Rogers contends that telecommunications is an effective educational tool when it enables a task to be completed more easily and more efficiently on-line than off-line. The goal of the CMS School-Net program was to create an innovative language and communication skills program. (Among other things, when students communicate with one another on-line, they are naturally motivated to maximize their writing skills.) Initiated by the Teacher Education and Computer Center in San Diego, California, the program has continued to grow despite economic setbacks, and today incorporates more than 40 nodes in the United States, Puerto Rico, and Argentina.

Paul Levinson describes university courses conducted via computer teleconferencing. The Connect Ed program, a computer conference on the New Jersey Institute of Technology's EIES network, originated to meet the needs of students of the New School for Social Research in New York City. Connect Ed's locally originated "campus" is accessible to students all over the world, enabling otherwise isolated students to participate in an exciting selection of college courses.

Carl Durance and Shirley Fenton describe work on Waterloo MacJANET, a program designed to maximize the teaching of computer skills in a lab situation. This local area network provides solutions to problems of disk management and file storage, helping maximize use of teacher time. Set up to accommodate the needs of computer courses at the University of Waterloo in Canada, the MacJANET system is now in operation in many computer labs across the continent.

Learning Link

A Model for Low-Cost Educational Networks

Robert A. Spielvogel

Introduction

The Learning Link interactive communications system, in operation at WNET/Thirteen since October 1985, provides a potential model for effective and cost-efficient servicing of precollege educational institutions on a regional basis.

This paper describes the current Learning Link system and discusses some of the experiences and problems encountered in its development and operation, particularly those with broader implications for organizations interested in using technology to improve access to educational resources.

Learning Link: A Model for Low-Cost Educational Networks

Learning Link is a computer-based network operated by WNET/Thirteen, the public television station that serves the metropolitan New York area. The system is a test-only interactive multiuser service that features data bases, bulletin-board-like conferences, information libraries, and electronic mail. It provides support for educators, mostly at the elementary and secondary school level, who utilize learning technologies such as television, video, microcomputers, videodisc, and on-line data bases as instructional tools.

After operating the system at WNET for nearly two years, we can share some experiences and observations that may be relevant to others interested in educational applications of telecommunications.

We are now at the stage where we can offer the system to other public television stations and education agencies. Each site will be an independent system adapted to local differences and needs. Together, the sites will form a network of independently operated systems to benefit from some central support and cost sharing. These issues also are explored here.

First, however, some explanation is needed as to why the nation's largest public broadcaster and producer of much of the programming found on public television stations around the country is operating a computer network.

Two years ago, WNET/Thirteen conducted an assessment of how the station could improve its support services for K–12 schools. WNET had operated a traditional ITV service consisting of broadcasts of instructional television programming designed specifically for classroom use, along with print schedules, lesson plans packaged into teacher guides for each series, and utilization workshops for teachers.

However, there were never enough education personnel to do direct outreach and training for schools—a problem that is especially acute at stations that broadcast in major urban areas. Within our service area there are just too many schools to reach on a direct basis. Fiscal realities make it unlikely that the educational outreach staff involved in providing these traditional services will be expanded significantly.

Ironically, utilization of public television programming and the need for support services are increasing. The arrival of videocassette recorders and microcomputers in large numbers has changed the information needs of schools dramatically. The VCR, available in more than 50 percent of all schools, allows teachers to use educational programming in a far more flexible manner—teachers are no longer tied to the broadcast schedule or limited to utilizing just the instructional television programs.

Teachers now request information on all of the programming aired: prime time science series such as *Nature*, *NOVA*, or *Planet Earth*, and cultural series created for specific in-class use. And they need more specific information than that found in the local newspaper or *TV Guide*. They want to know what a program is about in terms that are relevant to their instructional needs, what ancillary materials or experiences can be tied into it, exactly when to tape it, and what their legal rights and responsibilities are when taping a particular program.

We have found that print support materials alone can't handle, in any cost-efficient manner, the volume of information that needs to be available to teachers if they are to utilize the educational resources found on public television. Print support materials are increasingly inadequate as the sole means of disseminating information.

Another finding of our assessment was a growing need to position educational television within a context of learning technologies in general. Educators want to integrate video, computers, and data bases into complementary resources that work directly with their teaching, not as unconnected peripheral experiences. Treating television as a separate, isolated resource does not meet the needs of media coordinators, librarians, and classroom teachers who deal with a wide range of technologies, media, and programming sources.

Our conclusion was that while television, video, computers, and other learning technologies obviously offer notable opportunities for delivering educational resources to students, the key to realizing this potential lies in helping teachers locate and make effective use of high-quality programming that fits into their existing curriculum content or allows them to expand curriculum where appropriate. We decided to develop information services and information manipulation tools that place our programming in the context of the school curriculum and in conjunction with other learning technologies.

After reviewing service options including single-line bulletin boards, conferencing utilities like New Jersey Institute of Technology's EIES system, national on-line services such as CompuServe or The Source, and even using the vertical blanking interval or second channel stereo subcarrier of our broadcast signal for data downloading, teletext, or videotex, we formulated the set of assumptions that has guided the development of Learning Link.

Assumptions Behind Learning Link

The system must permit frequent change and modification. We needed a flexible set of tools during the startup phase. Our goal was to mount a basic service and then work with our users to refine and extend it. Since there were few successful projects to guide Learning Link's development, trial-and-error based, iterative design seemed the best strategy. We wanted a system that could be developed in a modular fashion based on feedback from schools using the service.

The system should run on off-the-shelf equipment and build on existing software to keep the initial funding requirements as low as possible. Requiring significant financial commitment to capital costs would limit our ability to replicate the system at other sites even if we were to obtain grants or underwriting support for a pilot.

The service needs to support growth and expansion. While our target market was 500 schools, we wanted to ensure that the system could handle significant expansion without forcing users to abandon their investment in hardware and software.

The system should present few barriers to school use. That meant requiring no specialized equipment or software that is unique to this service. The system should be accessible from equipment already installed in schools. Usage of the system should be on a float-rate basis; schools have difficulty with open-ended on-line charges or usage-sensitive billing.

The system should permit simultaneous access by several users and by system operators. Teachers are too busy to try again if the information is already in use or is blocked for updating.

The system should be accessible by a wide range of educators with varying degrees of technical sophistication. And it should be easy to operate, for the users and for us; our limited budget would not support specialized staff or extensive training.

Learning Link at WNET/Thirteen

For several reasons, we chose telephone-based microcomputer communications as the basis for the system. Schools now have microcomputers in significant numbers and often in several locations within a building. The interest in educational applications of telecommunications has resulted in a growing number of modems in schools, but beyond local bulletin boards, relatively few inexpensive services exist to support their use. The same software and hardware necessary to access Learning Link can be used to access other services.

The service was publicly launched in October 1985 and has since run 24 hours a day, seven days a week with no major technical problems and only minor service disruptions. We do not charge schools according to frequency or form of use. They pay an annual membership fee, for which they receive passwords to the system for designated staff members. Usage of the system is unlimited and users can call in from any micro—at school or at home.

The Hardware/Software Environment

The recent migration of multiuser operating systems to microcomputers, specifically XENIX and other implementations of AT&T's UNIX®, provided an inexpensive way of building a multiuser, multitasking host environment on PC-level machines. We started the service with eight ports of a PC. We have since moved up to a PC AT-type host with twelve ports and support for up to 2400-baud communication. In order to support the widest range of microcomputers, we assume no special intelligence of the computer terminal or terminal emulation software that dials into the system. We have found that many of our schools are using 40-column Apple and Commodore 64 computers, which limit the sophistication of the screen displays considerably.

Operating under XENIX, we use a commercially available videotex host application to handle end-user input, navigation, and directory structures. The application was originally developed to support touch-screen shopping kiosks using NAPLPS (North American Presentation Level Protocol Standard). While Learning Link remains a test-only service, we could add NAPLPS or Prestel graphics to the service (or a portion of it) if there were an application that justified the added editorial production costs and the purchase of the software or hardware decoders required by these graphic standards.

From this host application, we can execute any additional applications—such as mail utilities, a data base management system, or a text-editing system—that make information entry and management easier. These applications are written in C or UNIX shell scripts.

This environment is very different from that of traditional bulletin boards. It is "page-based" in that a user calls up one screen at a time. The pages are organized in a hierarchical, "tree-structured" file system. Each screen has a label at the top that tells the user where he or she is and how many pages there are at this level (such as 1 of 3). At the bottom of the screen are labels for commands to go to the next page, return to a previous page, or go up or down in the menu structure. The user's perception of the data structure matches the actual logical structure, and therefore it is extremely easy for even novice computer users to navigate around a large data base.

At points in the tree structure, the user finds a page that makes a call to an executable C program that provides access to true data base management programs or to applications such as mail or upload and download libraries. The shift to an application is usually invisible to the user, and the commands, look, and response of the application are designed to provide a seamless service. When finished with the application, the user is returned to the point in the tree where the shift occurred.

While this structure is useful for new users, it can be tedious for the more experienced, especially at 300 baud. The system supports an extensive number of keywords that allow users to jump to any specific point in the service immediately.

The system also has a range of tools that allow easy operation by the system operators and data entry personnel at the station. Most operations are selected from menus. Many of the operations are automated and performed on a regular basis by the system. For instance, we have automatic usage reports that allow us to track how frequently the service is used and compare the relative usage of the various sections. These are automatically generated after midnight on a daily and weekly basis by the system. The operators just print them out and distribute the reports, which we use to evaluate utilization of our content offerings.

Service Content

Learning Link currently has five main components: schedule and program information, forums, gateways to on-line services, mail, and product and resource listings.

Schedule and Program Descriptions. The first section is up-to-date schedule and program information for all programming broadcast by Thirteen. This interactive TV guide takes information from a number of sources—PBS, program producers, press kits, and teacher guides—and provides content rewritten for use by teachers. Each description summarizes a program and gives specific broadcast information. Users can browse or search by time, title, curriculum subject area, or grade level. The information helps teachers plan viewing or taping.

In addition, more extensive descriptions are available in a related data base file for each series that Thirteen broadcasts. These provide more detailed program descriptions at the series level, plus information on curriculum applications, recording individual program titles. This data base file can be searched with a variety of keywords also.

Forums. The purpose of a forum is to provide a place for teachers who share common professional concerns to communicate with each other on-line. The forums are subject specific; they focus on topics directly related to WNET programming as well as other topics of professional concern. While some forums are run by the WNET staff, we are encouraging teachers, curriculum experts, and professional organizations to mount and operate their own forums on Learning Link.

Some of the forums currently up on the system include *Square One TV* and *3-2-1 Contact*, both run by Children's Television Workshop; *Eyes on the Prize*: *America's Civil Rights Years, 1954–65*, run by a NYC public high school teacher who is a specialist in American history and political science; *Innovation*, the current events science program, run by WNET to supply secondary science teachers with background notes and strategies to use the series in their teaching; and a nutrition forum run by the Dairy Council to inform teachers of free or low-cost resources available to them and provide on-line access to nutrition experts.

Each forum contains some pages of information arranged in a menu-driven hierarchical tree. Although some forums have a great deal of information stored in this structure, the information tends to have a long shelf life.

Most forums also have a "message center," a form of the mail utility (described below) that allows users to post public messages or respond to previously posted information. These messages can communicate information to all users of that forum. Message length is up to the author of the message, and users can write with the simple editor provided or can "upload" messages that they have composed on their own word processors. Users can search stored messages by message number, date, sender, receiver, or subject. Upon entering a forum, users are informed of any new messages in the forum since they last checked.

Longer blocks of text can be stored in libraries of files for downloading. Entire teachers'guides, manuals, mailings, or lesson plans and worksheets can be stored in a forum library and selected for downloading to one's computer. Learning Link supports all popular file transfer protocols including ASCII, Kermit, X-Modem, and Z-Modem. Some forum libraries also allow users to upload files for distribution to others. The screen prompts and help features make file transfers easy to accomplish for all users regardless of their technical sophistication.

A forum can also link to relatively small flat-file data bases if relevant to the forum's content. This feature is useful for bibliographies, resource listings, and calendar-oriented information. Again, these files tend to remain static over long periods, since it takes some time and effort to build up the information.

Gateways. Our newest addition to the service is the capability to "gateway" to other services. A caller can choose a menu item on Learning Link and is automatically connected into a specialized remote data base. Before choosing to pass through the gateway itself, a user can review information on what is available, examine registration details (three of the four currently operating gateways are commercial services that charge fees for use), survey hints or lesson plans to help guide utilization, or use a message center for mail exchange regarding the gateway.

The gateway application program automatically dials the remote host and connects to it. Once at the doorstep to the gateway service, the user must log in, and from then on all data flowing between user and the new host is passed through Learning Link until the user exits out of the remote service.

One current gateway connects to New York City Board of Education's public access bulletin board, the Big Apple Board. We are working with the Board of Education and Teachers College on an in-depth study to learn how teachers and students use computer conferencing and on-line research tools. Teachers and students are using our other gateways to conduct research on selected topics. They then use the gateway to the Big Apple Board to discuss their findings, share problems and solutions, and reflect on the activity.

We currently gateway to Addison-Wesley's Einstein service, itself a gateway to almost 90 on-line information resources around the world. These data bases include full-text copies of international, national, and regional newspapers, the ERIC resource collection, the wire services, *Books in Print*, the *Readers' Guide to Periodical Literature*, the *Biographical Index*, the *Microcomputer Index*, and *AV-Online*. The service is menu driven and easy for novice researchers to use.

We also tie into Infosearch Scholastic Database, which features rapid full-text searching of encyclopedias and other reference works, as well as full transcripts of some of WNET's news and current affairs programming, such as *McNeil Lehrer Newshour, Currents, Adam Smith's Money World,* and *Nature.*

Our newest addition is McGraw-Hill's MIX service, which features a number of conferences on educational topics. MIX allows our users to connect to discussions with teachers or computer coordinators around the country.

The concept of providing gateways seems counter-intuitive at first. Why would someone go through Learning Link to these services instead of dialing in directly? Why do we want to tie up two of our phone lines for a single caller?

The reasons are straightforward: Our subscribers are often just beginning to explore the use of on-line resources. They are apprehensive about costs, and they want some support in the absence of guidelines or even well-documented teaching guides for many of these services. Learning Link helps identify services that are the most appropriate for school use and can provide exchanges for other users to accelerate the spread of information on how to utilize these services most effectively.

As our users gain sophistication and Learning Link becomes more refined, we will reduce costs to our subscribers and evolve the gateway concept to provide value-added services. These will include searching on Learning Link before connecting to the remote service (reducing vendor charges), connecting over high-speed modems and buffering the collected data back on Learning Link, or preparing a search strategy and downloading the strategy as a communications macro to work with the user's software on a directdial to the remote service.

Mail. Each user of Learning Link has a mailbox. Upon logging in, a user is told how many unread mail messages are waiting for him or her. The user can read these one by one or scroll through them in a continuous fashion that facilitates mail collection. The user can also read any previously read messages that have not yet been deleted from his or her box. After reading a message, the user can reply to it, delete it, or leave it in the mailbox. The mail system also enables a user to send a mail message to any other user on the system or to any of the forum message boxes.

Product and Resource Listings. In addition to our own data base of programming information, we have been searching for the best way to offer information about other instructional technologies and resources. Initially we evaluated an informational and transactional service called Best Buys. This service enabled subscribers to see information about selected software, hardware, and print products offered at substantial discounts. We had complete transactional capability so that with a purchase order number, a teacher could order any product and it would be shipped immediately.

While the idea appealed to many educators, we found that this service did not work well. First, WNET was not in a position to evaluate each and every product offered; we relied on evaluations published by other groups to select products for our catalog. This limited us to products that had been around long enough so that extensive evaluations were available. Our users wanted extensive listings, and they wanted information on new products.

Also, on-line ordering does not fit into the existing structures governing purchasing in most school districts. Actual purchases were rarely made; instead the information itself was considered the valuable aspect of the service. We are now revising this section.

We will mount catalogs for selected educational publishers and distributors who have extensive product listings that lend themselves to the advantages of a data base. The companies can gather leads of interested educators or, if they choose, can support direct transactions in their catalogs. However, WNET will not be directly involved in such transactions.

Another change involves moving the concept to other noncommercial resource listings. With the assistance of the Alliance for the Arts in New York City we are mounting a Culture Catalogue that lists museum resources and cultural organizations with services for schools. The Catalogue will cover permanent exhibits and performances, as well as those that change.

Formative Evaluation of Learning Link

We have received a grant from the Corporation for Public Broadcasting to evaluate the existing system, improve it where necessary, and test the feasibility of moving it to other public television stations. Our initial evaluations have centered on exactly who uses or could use Learning Link within the school context and what services they want that would foster regular utilization.

When one analyzes the school building in terms of telecommunications, some basic physical realities lead to hypotheses about who can use computer telecommunication and how they will use it. Because a user needs a microcomputer and a telephone line, the field narrows considerably. Teachers within classrooms are perhaps the least likely to be able to use such a service. In order to promote teacher use, access must be provided somewhere else in the building. Librarians, media coordinators, administrators, computer coordinators or teachers, curriculum specialists, and resource room teachers form a rough ranking of likely candidates, although teachers who have home computers also can use the service.

Indeed, our actual subscribers bear these hypotheses out. Librarians and media coordinators do form our largest group of subscribers, and they also represent the most frequent users of the service. They see it as their role within the school to promote information services, and the library in many schools is becoming the access facility to on-line resources. As we develop the service, we are trying to build resources that facilitate the role of the librarian/media coordinator as a resource for other staff members and students within the school.

A second area of development comes from the desire to make direct instructional activities for students available on Learning Link; we are extending the resources provided for the New York City research to all our schools. Our host software allows us to set up multiple services within the same host environment. The student service is kept separate from the professional service, but both are accessed in exactly the same manner. The users' log-in files direct them automatically to the appropriate service.

Finally, by using the type of low-cost terminals designed for home banking, schools can provide teachers and students with terminals for use at home or in locations that have no computers. The terminals, usually priced under $250, have built-in modems and can connect to regular television sets.

A different barrier to use arises around cost issues. We realized that open-ended billing was difficult for schools to deal with, but we underestimated the difficulties caused by just the local toll charge. Many of our subscribers call in from outside the immediate area code and are restricted in their use of long-distance phone lines. In many cases, only district-level personnel have the authorization to use long distance on a regular basis. In our evaluations, most subscribers indicated that they would be willing to pay a reasonable surcharge for toll-free access, and they saw this as the single best way to build utilization of the service. We have recently installed an 800 number service for New York, New Jersey, and Connecticut, and we are seeing a dramatic rise in use.

We have also found that the user learning curve is quite short; new users soon want more sophisticated features. Downloading of files to facilitate local storage and printouts is being added based on user demand. And while many of our users still have 40-column equipment, these formats are annoying to those with 80-column capability, especially in the messaging and information screens. We are now moving to variable-width formatting.

Within the forums, we have found that the role of forum manager is the key to the activity of the forum. The best forums have a core group of people who use them on a regular basis. Having a specific project or goal helps focus the forum. Open-ended forums, especially those with a philosophical bent, are not used. We have also found that many users have difficulty using the same utility to post and review public messages and send or read private mail. We are working on new structures that make this activity more intuitive. Another strong request by forum managers is for an easy-to-use survey tool to adapt to forums. Whether used for polling or for information gathering, this type of utility would add significantly to many forums.

Structurally, we have found that users prefer broad menus with many options rather than a deep menu structure with few options at each node. This matches findings from other research. While a bit more intimidating for new users, the broad menu is far less tedious over time. Even with our very extensive menu structure, we find relatively little use of keywords to speed navigation. The broader menu structure apparently serves to prompt users on choices available and still provides a structural scheme to the data base.

Finally, we are evaluating the question of critical mass: What is the correct balance between a depth and diversity of information that will attract and keep people using Learning Link, and a clearly focused service that is not struggling with the impossible mission of being all things to all people?

Answers to this critical question will emerge over time. The key is providing information and tools that meet real needs of educators. The benefits from use of an on-line service must be immediately apparent and quite tangible if the service hopes to attract more than a small percentage of potential users. While our program information is the driving force for our involvement in on-line services, the forums, gateways, and resource data bases are attempts to develop a successful content mix that attracts and sustains regular use.

Extending Learning Link to Other Sites

WNET's experience, and the specific system components it has developed, can benefit other stations eager to enhance educational or viewer services through the use of interactive systems. Given the cost of developing such systems from scratch, the limited funds available for such purposes, and the benefits of having a network of stations using similar protocols, this system has widespread utility and value to additional markets beyond the New York metropolitan area.

We are proposing a partnership of stations interested in using locally adapted and operated systems based on Learning Link or similar systems. Each operation would be independent and managed to suit the support services currently offered by the various stations. Some services would be centrally provided to all partners: program data bases, editing tools needed to adapt or modify the data bases to local schedules, installation and training, technical support, marketing materials, and hardware and software licensing.

The system can be shrunk or expanded according to need. Attaching fewer modems and phone lines lowers the operating cost until volume requires the additional ports. The system has provisions for running multiple hosts (linked PC ATs or PCs) if demand exceeds the capacity of 12 to 16 lines. In this way, each system can grow in modular fashion as the market grows and develops without facing large capital expenses.

The data bases formed on one Learning Link system can be moved to another system and run as is or modified to suit local needs. Given the nature of the system software, it is relatively easy to provide technical support remotely, with service available by having a centrally located support person dial in to the system and evaluate the problem or program a fix.

This model, in direct contrast to large, centrally operated and administered data base services, is based on the emerging power of microcomputers to provide services formerly found only on minis or mainframes. The model provides several advantages to public television stations:

- It preserves the independent control of local services and the ability to react and adapt to local needs.
- It provides for the diversity of services, administrative systems, and financial situations found at public television stations.
- It is economically feasible for most stations to capitalize such a system, given the low cost of the components, and to operate a service using existing personnel.
- It allows for resource sharing and central development, where it makes sense, so that each station doesn't have to duplicate efforts or expertise.

The model, while unique in some respects within the on-line data base world, is not an unusual model for public television stations. It is a simplified extension of the basic public television system for program development and distribution to the newer realm of computer-based telecommunications. For public television stations, the model creates a service niche that lies between the small, grass roots bulletin boards that have proliferated across the country, and the specialized on-line data bases serving a national or international audience, but too expensive for local educational support.

Robert Spielvogel

Robert Spielvogel, currently the director of Learning Link, was responsible for the original design and implementation of the system. Before beginning his work on Learning Link, he worked on a variety of projects for the on-line and videotex industry, specializing in educational, training, and user interface applications. Mr. Spielvogel's background includes work as a classroom teacher, elementary school principal, and graduate researcher in the field of educational psychology.

CMS School-Net

A Practical Approach to Effective School Networking

Al Rogers

A Tool in Search of a Task

Telecommunications in the classroom for the most part has failed to be an effective tool for instruction and the development of basic skills. It has more often been a theoretical, impractical, difficult, expensive, or irrelevant activity, often done as a "computer literacy" activity. Thousands of teachers across the country *own* modems; far fewer of them *use* modems. Probably the best that can be said of telecommunications in a popular sense is that telecommunications is a tool in search of a task.

Much emphasis has been given to the technology in the recent past. Classes and workshops in "how to telecommunicate" have been very popular. Many people have learned the basics of modem operation. Yet they still fail to use telecommunications on an ongoing, productive, wide-scale basis.

There are several reasons for this. One is the inherent complexity of most telecommunications user interfaces. Most would-be users of the technology are put off by such techno-trivia as parity, stop bits, baud, protocols, and the abstruse concepts of "upload" and "download."

Much has been made of the common problem teachers encounter in trying to convince administrators to install phone lines in close proximity to computers, if not in the computer labs. However, this problem is not as major as is commonly thought. Indeed, the idea that the teacher needs daily or frequent access to a phone line obscures the real problem with the phone line. The real problem is that the single phone line is a barrier to large-scale, effective use of the technology. Students probably type, on the average, at less than 15 or 20 baud. One phone line, used at this speed, will severely limit the numbers of students who can share an on-line experience in a given time period. Therefore, the real problem is not access to a phone line; rather, the problem is in finding ways to move student activities away from the phone line, so that a phone line is required only occasionally for batch exchanges of information.

Furthermore, successful telecommunications will occur only when educators and others come to grips not with the technology problems, but rather with the fact that a successful communications experience will occur only within the context of a carefully nurtured social situation that attends to certain critical sociological factors. It is possible to be a social isolate and be successful with a word processor, data base, or spreadsheet program. However, in a communications experience via modem, you must be part of a social structure. That is to say, there must be someone on the other end with whom you communicate. This need for collaborative interaction requires a vastly more complex, "slippery" sort of creature.

What Research Has to Say

For the past several years, Margaret Riel, Jim Levin, and other researchers at the University of California in San Diego have conducted an Intercultural Network, involving networking activities between schools here and in Alaska, Israel, Japan, Mexico, England, and other places. They have made some interesting discoveries regarding the role of networking in the academic life in the classroom.

In the Intercultural Network, networking is an extension of the writing process; that is, networking helps to meet the need to consider and define "audience." They have convincingly demonstrated that students who do meaningful writing for an actual audience write better than students who write for other purposes. They have also shown that the real-world audience, when combined with the nature of the medium itself, allows language experiences not easily available through other means. For instance, the benefits of computer-based writing include alleviating the often frustrating, if not impossible, task of deciphering handwriting. The text is easily captured, edited, and reused or published. The writing process is thus more readily integrated into the total language-learning experience, which includes speaking and reading as well as writing.

Riel has also provided some important caveats to consider when developing a school network. She found that all successful networking experiences she studied contained the following essential ingredients:

1. There is a task to be accomplished.
2. Using telecommunications to accomplish the task must be easier or more effective than other means.
3. Participants in the project know each other.
4. Participants are committed to the task.
5. There is some degree of accountability in performing the task.

CMS School-Net and the Research

These findings have guided the development of the San Diego CMS School-Net Networking Project. The purpose of this project is to improve student language and communications skills. It uses word processing to produce student writing, and it uses electronic telecommunications to provide distant audiences with whom to share that writing. As it has unfolded, the project has addressed each one of the essential criteria listed in the preceding section.

There is a task to be accomplished. Most action on CMS School-Net involves specific collaborative projects, lessons, and activities involving two or more classes. These activities are developed by the teacher-participants. They are designed to be meaningful to the students, and always involve a real-world audience. Some specific examples are described later.

Using telecommunications to accomplish the task must be easier or more effective than other means. The San Diego TEC Center has taken the lead in developing three tools to make the process of telecommunications easier for classroom teachers:

1. FrEdWriter is a public-domain word processor for the Apple computer. Students use FrEdWriter to do all of their writing activities, away from the telephone line: in their classroom, in the computer lab or library, or at home.

2. FrEdSender is a public-domain terminal program for the Apple computer. When the time comes to send student writing to the destination, the teacher uses FrEdSender to dial a FrEdSender at another school, or a local CMS School-Net bulletin board node, and sends off the student writing.

3. CMS (Computer Mail System) School-Net is a low-cost, Apple-based bulletin board system that handles the transmission of electronic mail (e-mail) and attached student files throughout the informal School-Net network. More on this later.

Participants in the project know each other. Teachers correspond extensively as a project is being developed. Efforts are made to help students learn about each other. Many initial contacts use the "pen pal" format. In many cases photos and other artifacts are exchanged. In some cases, classes become "sister classes."

Participants are committed to the task. There is some degree of accountability in performing the task. In planning a project, teachers set timelines and make agreements. Once a project is announced to the students, there is usually a high degree of commitment, and the students hold the teacher accountable to complete the task.

What Exactly Is CMS School-Net?

CMS School-Net is an informal, grass-roots telecommunications network. Each CMS electronic bulletin board represents a node in the network. Each node operates independently during the day as a fairly normal-looking electronic bulletin board program. However, it has two features that make it unique among electronic bulletin boards:

1. It allows you to send lengthy files of student writing to your correspondents.

2. In the middle of the night, all of the CMS nodes in the network begin to busily dial each other up and exchange e-mail. Thus, a teacher in San Diego can send a batch of student writing to a teacher in Philadelphia, or Connecticut, or Puerto Rico, or Florida, or one of 25 to 30 other places. There is no charge for this capability, and new nodes are being added each week.

CMS School-Net is not an information utility. Its primary function is to transmit student writing from one place to another, thereby opening up distant audiences for students. School-Net is more properly thought of as a writing tool, one that can be used effectively at any grade level and in any subject. The purpose of and emphasis behind CMS School-Net is to provide real audiences and real purposes to motivate writing!

For the most part, students do not correspond directly with each other. Most activities grow out of teacher-developed projects and are implemented through teacher-to-teacher contacts.

Students do all of their writing away from the modem, away from the telephone line. In a well-designed program, the phone line should be used only occasionally, to transmit a batch of student writing quickly and efficiently. It should alleviate the pressure for acquiring expensive dedicated phone lines in order to participate in a network, thus enlarging the audience of potential teacher-participants.

As with any writing tool, constructive and approprate writing will occur only within the context of a purposeful, structured writing program or project. Therefore, CMS School-Net emphasizes specific, well-planned collaborative writing activities that encourage interested, productive participation by students and teachers.

How to Get Involved in CMS School-Net

The following suggestions will help you become involved in a local CMS school-networking project:

1. Be a "writing teacher." You don't have to be an English/language arts teacher. If you teach science, social studies, or some other discipline that employs writing, you can use CMS School-Net to have your students write about your subject area. Collaborative activities can involve cultural exchanges, statistical data collection and analysis (surveys, questionnaires, demographics), science experiments and observation (astronomy, geophysics, weather and climate, pollution), and any other activity that creative minds can invent.

2. Have access to computer(s) on which your students can write (for example, Apple, IBM, or Commodore computers).

3. Have a compatible computer with a modem and a phone line available either at home or at school (lab, workroom, principal's office, and so on).

4. Have telecommunications software that supports XModem. Examples include the following: for the Apple II, ASCII Express (ProDOS® version), Point to Point, or FrEdSender; for the Macintosh, Red Ryder; for IBM-compatibles, CrossTalk.

5. Have some time ("spare" or otherwise) to learn some new concepts during the startup phases of this operation.

6. Use your telecommunications program and your modem to dial up and log onto a local CMS bulletin board and set up a new account.

7. After your account has been validated, you'll be ready to begin networking with other teachers. Begin by entering the <E>Mail section of CMS and browse through the $IDEAS section. This is similar to a public bulletin board area where projects are advertised, collaborators solicited, and activities discussed by participants throughout the network. Look for an activity here in which you can participate the first time.

8. Recruit other teachers to join you in a project. Post an "announcement" of your project in the $IDEAS section of your local CMS bulletin board. This announcement will automatically be posted on every other local board in the entire network.

9. With the help of your newfound collaborators, develop and complete the various projects in which you participate.

Examples of Projects

Many projects have been completed this past year on the San Diego CMS School-Net. Some examples:

- A book of proverbs (*refranes*) compiled in Spanish and English, involving classes in Tijuana, San Diego, Hartford (CT), and Puerto Rico

- A book of riddles compiled from students all over San Diego County

- Letters to Santa Claus, involving primary students and junior and senior high students from all over San Diego County
- A collection of "outrageous opinions" solicited from junior high school students and published in an anthology

Several classes have established "sister class" relationships, involving classes in California, Connecticut, and Puerto Rico. In-depth projects have included exchanges of photos, audio- and videotapes, and school and community memorabilia. Students have exchanged information regarding holidays, celebrations, school activities, and other subjects.

Another Example: Lincoln, Nebraska Kids' Travel Agency

During the summer of 1986, a pilot networking project took place between three San Diego Schools and the Lincoln, Nebraska, School District. The Lincoln schools set up a Kids' Travel Agency as part of their summer school program in June. They sought to collect data from all over the U.S. and put it in their data base, and then to develop information packets for people interested in taking their children on vacation to one of the places researched.

On June 16, 1986, San Diego received the following request for collaboration:

> Kid Travel, Inc. Survey, Lincoln, Nebraska, June 16, 1986
>
> We need the help of kids in your area!!! Please fill out this survey by listing the 5 or 10 "best" under each survey question. For each item you list, please give the name, address, phone, and a brief description of the item. Remember, this survey is to be filled out by "kids," not adults. We want to know kids' favorite places to eat, stay, and visit.
>
> 1. What are the "best" places to eat in your area?
> 2. What are the "best" places to stay (hotels, motels, campgrounds, etc.) in your area?

3. What historical attractions are there in your area?
4. What special festivals, parades, fairs, etc., happen in your area?
5. What special things are there to see, such as zoos, museums, art galleries, botanical gardens, architectural sites, etc., in your area?
6. What tours are offered in your area?
7. What amusement or state/national parks are in and around your area?

We set up a CMS node in Lincoln, which linked them up with the San Diego School-Net. An appeal was then made on the San Diego School-Net for classes in San Diego to write to Lincoln students about things to do in San Diego. Three classes responded.

After considering their audience (most of whom never have seen the ocean, or a killer whale, or Disneyland, and so on), the students eagerly described their environs to their distant correspondents. The students in San Diego were eager and motivated to write. The students in Lincoln were eager to read and edit and process the writing at that end. It was a very productive telecommunications experience.

Technical Details on CMS

Ordering CMS

CMS School-Net, FrEdWriter, and FrEdSender are disseminated by the Softswap Project of California Computer-Using Educators, Inc. Address mail, inquiries, and purchase orders to CUE Softswap, P.O. Box 271704, Concord, CA 94527-1704.

FrEdSender and FrEdWriter can be duplicated and disseminated freely—there are no limits on the number of copies you make. CMS, however, is not "public domain"; you may not make unlimited copies. It is provided at minimal cost and as a service to the educational community. However, you must purchase a separate CMS package for each electronic bulletin board you set up.

Hardware Requirements

The minimum hardware required to operate a CMS node includes:

—128K Apple IIe (a 64K Apple IIe or an Apple II Plus with three drives will also work; Apple IIc is not supported)

—Two 5.25-inch floppy disk drives

—One of these modems:
  a. Hayes internal Micromodem II or IIe
  b. Hayes external Smartmodem 300, 1200, or 2400 with Super Serial Card and custom RS-232 cable or cable adapter
  c. An external modem that is fully compatible with Smartmodem
  d. Novation AppleCat 300 or 1200

Note: The modem you select must support full AT Command Set, S-Register Settings, and full switch control and must support actual DCD and DTR data lines. Note that Apple modems, including Apple Personal Modems, do not provide this support, and will not work with CMS. If you purchase a modem that is not Hayes external, you should secure an agreement stating that if the modem does not work with CMS, you can exchange it for one that does. Hayes internal Smartmodem compatibles have NOT been tested with CMS, and may or may not work.

The following additional hardware is recommended:

—ProDOS-compatible clock card (times calls; allows overnight dialing of other CMS systems)

—More disk storage (for example, three or four 5.25-inch drives, a 3.5-inch 800K drive, or a hard disk)

Types of CMS Systems

NODE. Serves several local schools. Connected to a hub and perhaps other nodes. Has limited disk space. All calls are local, and 300 baud modem is adequate. Clock card is optional; can operate on an Apple II Plus or 64K Apple IIe if there are not too many users. Two disk drives provide barely minimum capacity; three drives are recommended.

HUB. Links several nodes together and serves as the local gateway to the region gate. Can also serve as a node for nearby schools. All calls are within a limited region; 128K Apple IIe with three or more drives is required; 800K disk space is recommended. Clock card is essential. Minimum 300 baud is required, and 1200 or 2400 baud is desired to handle a larger volume of intersystem e-mail.

GATE. Serves as the gateway to distant CMS School-Nets. Connected to several hubs and one or more distant gates, which may incur long distance charges. Should have a large amount of disk storage, for example, 5–10 megabytes or a RAM disk. Clock card and 1200 or 2400 baud are required.

Other Requirements

ProDOS. A knowledge of ProDOS is helpful. The CMS manual does not provide a tutorial on ProDOS and its hierarchical file structure. You should have a reference book to provide guidance along the way. Here are three good references:

- *ProDOS and Beyond*, Gary Cornell, 1985, Wiley Press.
- *BASIC Programming with ProDOS*, Apple Computer, 1984, Addison-Wesley Publishing.
- *Beneath Apple ProDOS*, Worth & Lechner, 1984, Quality Software.

COPY II Plus. You should have Copy II Plus, Version 6 or later (available from Central Point Software, 9700 Capitol Highway #100, Portland, OR 97219). This program is a lifesaver for formatting and copying disks, creating subdirectories, and so on.

TIME. The installation and troubleshooting of clocks, disks, modems, and the CMS software is fairly technical. If you do not have the technical skills required, you should find someone who does to help you set up your bulletin board system. Reading the manual, installation, and setup will take anywhere from one to three days, depending on what mistakes you make and what kinds of hardware/telephone-line problems you encounter. Once the software and hardware are properly installed, you should have little trouble operating the system yourself if you read the manual. However, there is a time commitment involved in keeping the hardware and software running and in encouraging and nurturing productive activities on the network. This time will vary depending on the volume of traffic your system handles—the more callers, the more time you will spend "sysopping." Plan on spending a minimum of two to three hours per week, however.

Editor's Update

At the time of this update, the San Diego Teacher Education Center's technology-related projects had been adversely affected by recent budget cuts in the California Department of Education.

Because of its grassroots support and its success as perceived by both participants and observers, however, CMS School-Net is in fact expanding, with additional nodes being created in San Diego and Oklahoma. Although the TEC-operated bulletin board, which represented a central hub in the network, has been discontinued, virtually all of its functions have been delegated to other nodes in the network. Moreover, various groups such as San Diego State University, the Fullerton (California) School District, and CUE have agreed to contribute to the long-distance costs of the network.

As Al Rogers recently noted, "The challenge to CMS School-Net is not a technical one but rather a sociological one. The need to discover how best to use the network and its sociological implications continues to be of paramount importance." Given the financial constraints, however, no formal or informal evaluation of the network and its effects is currently being planned.

Al Rogers

Al Rogers was a pioneer computer-using educator, having assembled his first microcomputer from a kit in 1976, and then teaching himself programming in a variety of computer languages. Since then he has been helping students and teachers learn how to use computers to improve basic skills and increase productivity.

In 1983 he became the computer specialist at the Teacher Education and Computer Center in San Diego, California, where he continues to coordinate the countywide training program for the use of technology in instruction. He has been a leader in the integration of technology into content instruction.

As the author of FrEdWriter and the guiding force behind the development of the related FrEdLessons, Mr. Rogers has made a significant contribution to the effective use of Apple computers in all content areas. He was featured on the cover of the January, 1987 issue of Electronic Learning Magazine *in recognition of his work on FrEdWriter.*

Mr. Rogers continues to be vitally interested in combining his technical expertise with his understanding of the problems facing teachers in the classroom. His current project, CMS School-Net, seeks to make the exciting benefits of electronic networking available to any classroom teacher. Currently, he is an independent consultant in education technology.

Connected Education: The First Two Years

Paul Levinson

Connected Education is interested in the informational basis of education, and the ways in which technologies that move information rather than people can facilitate quality education in global and local communities.

Since the fall of 1985, Connected Education has been offering courses entirely via computer teleconferencing for graduate and undergraduate credit in conjunction with the M.A. in Media Studies program at the New School for Social Research and Polytechnic University in New York City. Some 200 people from Japan, Singapore, the Middle East, England, Panama, Colombia, and across the United States and Canada have taken courses taught by faculty all around the world on such topics as applications in telecommunications, telelaw, electronic publishing, desktop publishing, ethics in the technological world, issues in international telecommunications, artificial intelligence and real life, and fiction writing.

The heart of the program is asynchronous computer conferencing on the Electronic Information Exchange System (EIES), in which faculty and students enter and read comments, complete papers, and carry on discussions, day or night at times of their own choosing. We've found that this ability to communicate at one's own convenience—totally via personal computer and modem located in the home or place of business—greatly enriches the intellectual quality of the exchanges. Our campus also consists of a Connect Ed Library, with hundreds of papers available on-line 24 hours a day, and a Connect Ed Cafe for electronic social exchanges.

This paper is a progress report on Connected Education's first two years—with a discussion of our accomplishments, our problems, and our projections for future growth. We have found the following questions and issues pertinent to the development of an on-line educational program: What degree of training and prior comfort with computers and computer telecommunications do students require before commencing their on-line studies? What subjects seem most appropriate for the text-oriented environment of computer conferencing? In what ways can on-line environments provide social interactions that play important roles in traditional in-person campus life? To what degree should research and assignments in course work entail off-line library readings in addition to on-line data bases? Can an on-line student with sufficient disk storage make do without paper? What possibilities for international cross-pollenization are opened up via on-line education? Several of these questions will be considered in detail in this paper.

The level of student satisfaction and output (in terms of conference comments, final papers, and reports) in the Connect Ed program has been very high. To what extent is this the result of a self-selected elite serving as pioneers in on-line education, and to what extent are the satisfactions of on-line work transferrable to the population at large? Facility with written communication seems both necessary for and stimulated by participation in on-line education. What impact will the introduction of voice-print technologies have on this literacy focus?

An area of special gratification to Connect Ed has been the participation in our program of a student totally deaf since birth. The student's prior educational experience had been either in sign language classes for the deaf segregated from the general population, or in general-population classes in which participation took place via tape-recorded lectures that were later transcribed. The computer conferencing environment allows this person to interact in a full and satisfying way with faculty and students. For the first time in his life, his deafness is not an educational handicap. What further opportunities does on-line education hold for handicapped people?

The Connect Ed teacher must be (a) a gifted teacher in the traditional in-person classroom, and (b) someone with an affinity for computer conferencing and on-line work. The introduction of talking motion pictures put many stars of the silent screen out of work—their voices were not compatible with their images. How many of today's in-person teachers have the makings of effective on-line instructors? Will the on-line environment select a new type of teacher—one willing to sign on every day and enter messages frequently, but from the comfort of home and without the rigors of commuting or the need to live near or on a campus?

Connect Ed students can now matriculate and pursue the M.A. in Media Studies (awarded by the New School) almost entirely via on-line work. Matriculants come from as far away as Bogotá, Colombia, and from both coasts of the United States. A next logical step is the development of an on-line doctoral program, which will allow students from any place in the world to study with the best minds in the world. Such a doctoral program is now being developed by Connected Education in conjunction with the Polytechnic University of New York.

Connect Ed and the International Community

Our program rests on the recognition that many people all over the earth do not live in physical proximity to the education they might want to pursue. Our Electronic Campus—a specially tailored system of computer conferencing located on the Electronic Information Exchange System (EIES) of the New Jersey Institute of Technology—allows participants to access courses, read and write comments, peruse on-line papers, relax in our Connect Ed Cafe (a special computer conference), and complete course assignments anytime—24 hours a day, seven days a week—from any place in the world with a personal computer, a modem, and access to a telephone.

Approximately 15 percent of our students have studied with us from Japan, Singapore, England, Canada, the Middle East, and South and Central America. In fact, students from Bogotá, Colombia, and Ottawa, Canada, have already matriculated for the M.A. in Media Studies totally by computer conferencing. They will complete their degree requirements within a few years, without ever having to leave their homes or places of business.

Last summer we offered a special Issues in International Telecommunications course team-taught by faculty located in Washington, D.C., New York City, and England. Students from across the United States and Canada and from Tokyo and England discussed such issues as special data-packet rates for educational uses and satellite rights in space, as well as ways that the Third World can get on-line most efficiently. More than 400 comments were generated by faculty and students in this two-month masters-level course, and we intend to make it a permanent offering every summer (June–July) in our program.

The asynchronous nature of computer conferencing is ideally suited to education across the globe. A faculty member in San Diego may start a course with an introductory comment or two. Students in California and South America will likely read the comment within a few hours, and enter responses and further commentary of their own. Far Eastern participants will next read and add to the growing commentary. Within a few more hours, people on the East Coast of the Western Hemisphere will be accessing the conference, and the cycle continues throughout the course. Since people are accessing the course at times of their own choosing, the level of participation and commentary is far richer than that often obtained in conventional in-person seminars. People participating at their best make for memorable educational experiences. Our students tell us they benefit far more from on-line seminars than from in-person classes.

The capacity to record or "download" on-line material for scrutiny and response off-line allows people to participate fully in the program with less than perfect writing facility in English. Further, although the New School requires some ability to write in English for pursuit of its degrees, we are now in the process of arranging for translation assistance where needed.

Research and completion of assignments is greatly facilitated by our Connected Education Library, containing hundreds of papers on-line about various topics relevant to our courses. Problems of obtaining books by slow international mail vanish when readings are all available on-line 24 hours a day.

Among the most rewarding aspects of our program is the creation of friendships and business relationships among participants from various parts of the world who met on-line in our program. The problems of our world require nothing less than the full use of talents and intelligences and perspectives located all over the globe, and we will continue to do our small part to make this world community a reality.

The Connect Ed Campus: Motivation, Philosophy, and Design

The Connect Ed Campus on EIES is a specially designed or tailored subsystem of the interlocking conferences, notebooks, and group-defined commands. The campus has served hundreds of students registering for some 20 courses leading to an M.A. in Media Studies granted by the New School for Social Research in New York City. Connect Ed has also offered courses for the Polytechnic University of New York. Typical students include working professionals and teachers, as well as graduate and undergraduate students.

The purpose of the campus is to make the powerful system of EIES easy to use by people with varieties of computer experience (sometimes literally none, but usually at least a little) and varieties of hardware and software. Our ideal—to which we've held fast—is that any model computer with telecommunications hardware and software can be used effectively in our program. Typical computers range from popular Apple and Macintosh and IBM models to older, more esoteric CP/M machines. Our philosophy and approach has been to tailor the on-line environment so that drastically varying off-line systems—ranging from $300 Radio Shack laptops to PC ATs selling for thousands of dollars—can participate on a more or less equivalent basis with no necessary addition of external software. General startup time for people with little or no on-line experience has been less than a week for effective participation (construed as an ability to read and write course material in conferences).

The campus consists of three fundamental parts: a help system with varying degrees of explanation; conferences in which courses are actually conducted; and conferences and notebooks in which other campus activities take place (for example, Connect Ed Library with hundreds of on-line papers or Connect Ed Cafe for social conversation).

The Help System

The texts for our help system (usually 30 to 100 lines of explanation about a particular EIES feature or process) are stored in an on-line notebook, accessible to everyone on campus via standard notebook reading procedures. We also distribute a Connect Ed Handbook containing printed (and reformatted for better appearance) copies of all the notebook pages. But the most frequent means of student access in the help system is via a series of defined commands. Students are given their first glimpse of these commands via a basic menu system delivered to them at sign-on (which can be removed from sign-on delivery via a single command). This menu, for example, indicates that a command called "+write" will deliver a page of information on how to enter material in EIES conferences or send messages. The "+advanced" command leads to a submenu of more sophisticated help explanations, including how to upload and download or search for earlier comments in conferences.

A superb EIES feature allows organizers of groups to define commands for members of the group. A group-defined command—such as "+write"—is keyed to retrieve a given page or pages in the help notebook. Thus, a student typing "+write" is really instructing EIES to display, say, pages 6 and 7 in the notebook where the text is permanently stored. In this way, Connect Ed has utilized a powerful EIES feature to make the system easier to learn and master.

As our campus grew, we became aware of the need for expansion of our help system in response to newly perceived student needs. For example, many of our students enjoy real-time, synchronous on-line chatting, so we created a new command, "+realtime," which delivers two pages of explanation and advice about real-time conversing. This command was duly placed in the advanced menu. We are currently writing a "+longtext" command that will give students pointers on placement of long documents such as reports and papers in conferences.

Access to Courses

The purpose of the help system is to enable students to participate as quickly and fully as possible in their courses—which of course are the heart of any educational program. The "innate" EIES commands for accessing of conferences are, like some of EIES's own help explanations, a bit difficult for students to quickly master and internalize. For example, a student can access a conference titled Artificial Intelligence and Real Life via EIES "raw" commands by typing "++2, Artificial Intelligence and Real Life" at any prompt. However, a single misspelling invalidates the command. An alternative EIES command accesses the conference via "++2" (the conference number). But numbers have no intrinsic connection to the titles and subjects of courses, and may be easily forgotten or transposed. So we perceived the need for an easier way of accessing conferences.

Our solution again involved the group-defined command feature. We define commands that have intrinsic meaning to the course subject or title. When students type "+ai" for Artificial Intelligence and Real Life, for example, they are actually calling up EIES' "++2, Artificial Intelligence and Real Life" command. The upshot is that the students get the power of EIES in an easy-to-use package.

A key concern on any campus is that only those students registered for a course have access. The definition of commands for our entire on-line group in no way enters the entire group into the conference. Rather, by typing the defined command, the student is in effect requesting access to a given conference. If he or she is not a member of that conference (not registered for the course), EIES gives a polite on-line notice to that effect.

All course access commands are displayed at sign-on via a campus "map" that is automatically delivered along with the basic menu mentioned above. The campus listings can also be displayed by typing "+campus" at any prompt.

Many of our courses are repeated on a regular basis. The definition of a new group command with the same name as an earlier command automatically replaces the earlier one. Thus, the "+ai" command defined to access conference 2000 will replace the "+ai" defined last year to access conference 1500. On occasion, we define new commands to access older conferences. We render them accessible only via the raw EIES command because few of our students need to access them.

We occasionally make use of notebooks rather than conferences when we conduct classes in which group authorship of reports and other notebook features are important. Commands for accessing notebooks work the same way as commands for accessing conferences, and we use the same group-defined commands for these notebooks.

Other Activities

Our Connect Ed Library is probably the most important intellectual part of our campus other than our courses proper. A "+library" command, listed on the campus map displayed at sign-on, produces a list of library holdings. (The list itself also is stored as text in a notebook accessible to all.) The list consists of a series of defined commands keyed to access the text of papers, reports, documents, and the like stored in an accessible notebook. For example, by typing "+marshall," one would get my paper "Marshall McLuhan and Computer Conferencing"; typing "+mod" would deliver Andrew Feenberg's paper on "Moderating an Educational Teleconference."

The papers themselves are at first entered into our library via the special "+read" feature, which among other things gives the enterer of the paper a notice each time the paper is read. Thus, our Connect Ed librarian can tally how many times given papers are read, and by whom. Our library is currently available at no cost to our students and others to whom we have given campus access. In the future, however, we may charge a fee to nonstudents for accessing library papers, and in turn be able to pay a royalty to authors.

In addition to papers and reports, summaries of in-person conference proceedings and gateways to other collections of papers on EIES are featured in our library. All are accessible via simple thematically relevant defined commands.

Material on academic standards, course requirements and offerings, and Connect Ed copyright policies (which hold that all materials are presumed copyrighted by the author, whether faculty or student) are stored in notebook pages readily accessible via our group-defined commands.

Our campus also includes the Connect Ed Cafe, accessible via "+cafe." This is a quite popular "hang-out" and site for social conversation. Other features such as an address book (student and faculty names, EIES addresses), job posting board, and the like complete the ambience of our campus.

Again, our campus is constantly undergoing revision and expansion. A new command, "+speak," will give students all over the world access to the in-person speaking schedules of our eminent faculty. Using this feature, students can make arrangements to see a faculty member who happens to be speaking in their area.

Summary

Connect Ed has used the potent features of EIES to make the system even more potent, for ease of use is an important criterion of potency. The key to the success of our campus is not any one feature—such as defined commands for accessing conferences or the Connect Ed Library—but the interaction of all the defined commands and features so that conferences and library papers and help features are all readily accessible via compatible and similar commands. This interlocking and interacting series of systems is in fact our Connect Ed campus.

Paul Levinson

Paul Levinson is founder and president of Connected Education, Inc., a not-for-profit corporation that offers on-line courses for graduate and undergraduate credit in conjunction with the New School for Social Research, and organizes computer conferences for a wide range of business, professional, and academic groups. He is associate professor of communications at Fairleigh Dickinson University, on the faculty of the Graduate Media Studies Program at the New School, and on the faculty of the Western Behavioral Sciences Institute.

Mr. Levinson is the author of Mind at Large: Knowing in the Technological Age *(Greenwich, CT: JAI, 1987), and the editor of* In Pursuit of Truth: Essays on the Philosophy of Karl Popper *(Atlantic Highlands, NJ: Humanities, 1982). He has published nearly 50 articles on the philosophy and history of technology. He holds a Ph.D. in Media Theory from New York University.*

In 1987–88 Mr. Levinson is visiting professor at Polytechnic University's Philosophy and Technologies Studies Center, where he is developing an on-line Ph.D. program in Philosophy of Technology. The first volume of Electronic Chronicles: A Compendium of the Connected Education On-Line Intellectual Community *(edited by Paul Levinson) will be published by JAI Press in early 1988.*

The Network Advantage in Education

For the Apple Macintosh

Carl M. Durance and Shirley L. Fenton

Waterloo MacJANET, a local area network developed by the University of Waterloo for the Apple Macintosh computer, meets the special needs arising from the use of computers in the classrooms of academic institutions.

This article describes the solutions Waterloo MacJANET offers to such challenges as providing students with an environment appropriate for developing computer-related skills, minimizing both the human resources and the computing resources required to support such courses, and efficiently distributing a variety of computer files to large numbers of students while providing security and copyright protection. Waterloo MacJANET was chosen for the Apple Classroom of Tomorrow℠ (ACOT℠) project as the networking solution for the Apple Macintosh. As Bob Howard, who works at the ACOT site at West High School in Columbus, Ohio, says, "Waterloo MacJANET. . . is proving to be very vital to our classroom management, as well as opening new doors for activities we can do."

Background

For more than 20 years, the University of Waterloo has had a strong commitment to teaching students how to use computers. The original approach was to introduce students to computers by teaching the basics of computer programming. But because of recent advances in both hardware and software, many students no longer need to have an in-depth knowledge of traditional computer science concepts in order to use a computer as a productivity tool.

The goal of the new introductory computer science course at the University of Waterloo (CS100: Introduction to Computer Usage) is to provide students from all disciplines with the ability to determine when and how a computer might be used for problem solving. To achieve this goal, students are introduced to universal computer tools such as word processors, electronic spreadsheets, and data base management and presentation graphics software.

Extensive practical experience with a personal computer is considered essential to developing these skills. The Macintosh was chosen to support the course because of its consistent and easy-to-use graphical interface—and also because of the abundance of good Macintosh software.

The implementation of such a course to support 600 students per term posed a number of administrative and management challenges:

- To provide a computing environment that aids, not hinders, the students' development of skills.
- To minimize the human resources required to administer the course.
- To minimize the equipment required to support the course.

A major problem was finding an efficient method of distributing a variety of computer files, including:

- Application software
- Course data files
- Sample programs and data
- Files required for exercises, assignments, and quizzes

Using disks to distribute and manage this number of files would have required a major investment of time and effort. Even if unlimited human resources were available, smooth administration of the course materials was still unlikely. Problems with out-of-date application software, errors in problem data sets, missing data files, or bad media were likely to necessitate some disk recalls. Further, how were student files to be safeguarded and how was copyright protection to be provided? It was anticipated that these problems would have a major impact on, if not preclude, the success of the course.

A distribution system that would allow the sharing of software, course data files, and peripherals became a major requirement for course implementation. The solution would also need to provide safeguards for copyrighted software and user files.

The Waterloo MacJANET Solution

To alleviate the administrative and management problems and further the effectiveness of the Macintosh as a teaching tool, software was developed by the University of Waterloo to network the stand-alone machines. Waterloo MacJANET, a descendant of Waterloo JANET for the IBM PC (also developed by the University of Waterloo), is networking software designed specifically to meet the needs of the educational environment.

The system supports a large number of users through workstations connected to a central data and print server.

Waterloo MacJANET for the Macintosh personal computer consists of a Macintosh equipped with a hard disk acting as the network data server, connected to a number of Macintosh workstations using Apple's built-in AppleTalk® hardware. The users share the network server hard disk.

Common software applications and data can be stored on the network server and shared by users of all of the workstations. The students' private files are also stored on the server. Output for an AppleTalk-connected ImageWriter® and/or LaserWriter® printer can temporarily reside (that is, be spooled) on the shared hard disk while awaiting print.

Using the Network

An important design goal of the Waterloo MacJANET network was transparency to the user. Normal Macintosh procedures are used to manipulate the network disks—the same familiar procedures used with regular disks in internal or external disk drives. Similarly, printing a document using the network spooler is as easy as sending a document directly to the printer over AppleTalk.

A user gains access to the network through the Waterloo MacJANET desk accessory (Figures 1 and 2).

Figure 1
Choosing Waterloo MacJANET

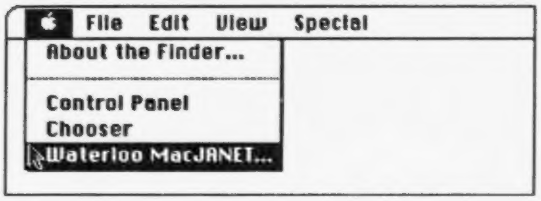
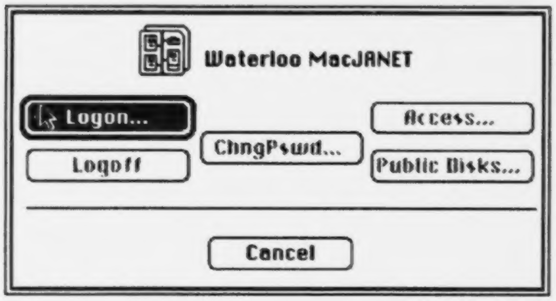
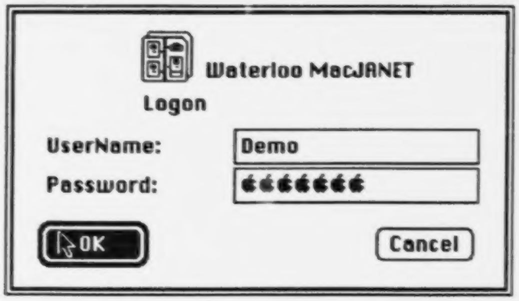


Figure 2
Logging onto Waterloo MacJANET


Waterloo MacJANET
Logon...
Logoff
ChngPswd...
Access...
Public Disks...
Cancel

Along with the user name, a password must be specified, to protect the private data belonging to that user (Figure 3).

Figure 3
Entering User Name

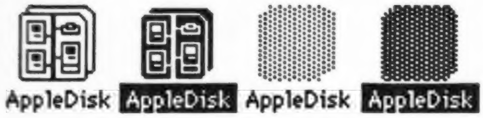

Waterloo MacJANET
Logon
OK
Cancel

UserName: Demo
Password: •••••••

This action, which is called "accessing a network disk," automatically provides access at the workstation to the individual's files on the shared, network server Macintosh. These files appear on the desktop just as if the user had inserted a disk into a disk drive attached to the workstation Macintosh.

Network disks are used in the same fashion as disks located in the internal or external drives. The network disks are represented by a special disk icon, which may appear in one of four forms—accessed, selected, opened, or opened and selected—according to its state (Figure 4).

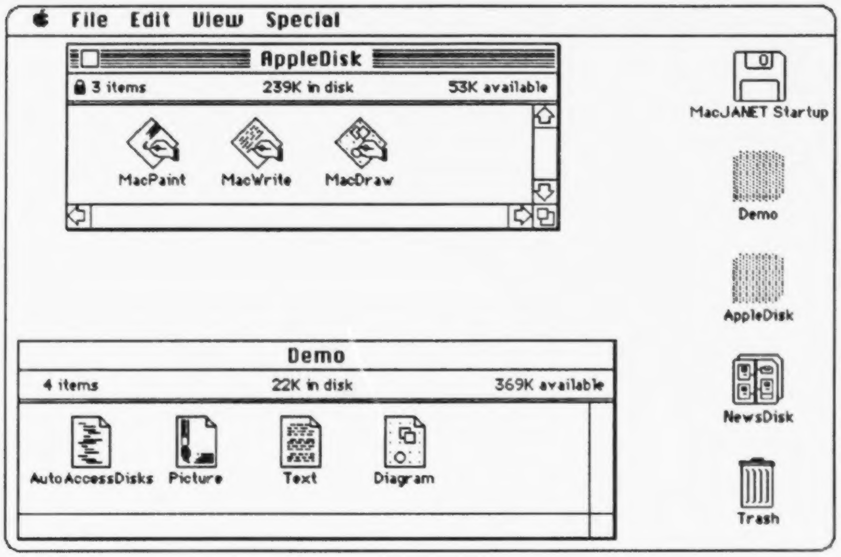
Figure 4
Network Disk Icons



Access to selected network disks can be provided automatically to users when they log on. Usually these disks are read-only library disks containing necessary application programs and data files. Because access to these network disks is predefined, the user need not learn the mechanics of the manual procedure to access additional network disks.

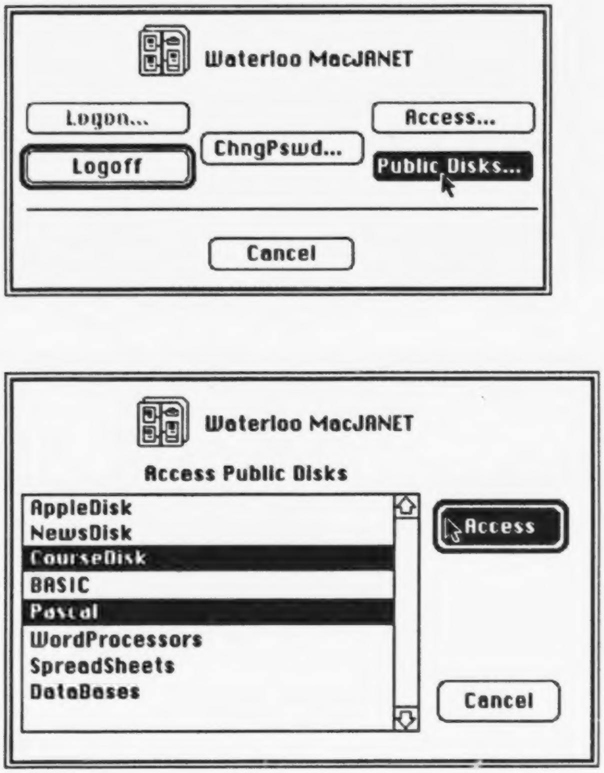
Using the Waterloo MacJANET desk accessory, the user can access other network disks, such as public library disks containing application software or data files. Again, these network disks provide the illusion of real disks in a workstation disk drive (Figure 5).

Figure 5
The Desktop with network disks. The locked disks are public library disks. The Demo disk is a private network disk.


File
Edit
View
Special
AppleDisk
3 items
239K in disk
53K available
MacPaint
MacWrite
MacDraw
Demo
4 items
22K in disk
369K available
AutoAccessDisks
Picture
Text
Diagram
MacJANET Startup
Demo
AppleDisk
NewsDisk
Trash

The user can access other public disks by selecting the appropriate network disk names from a displayed list (Figure 6).

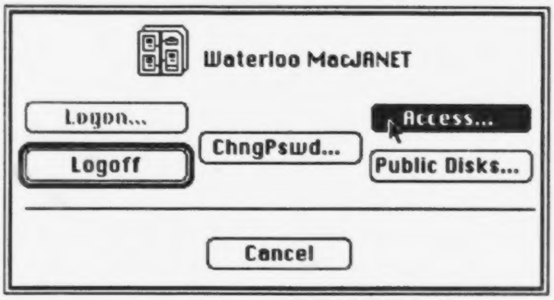
Figure 6
Accessing a Public Disk

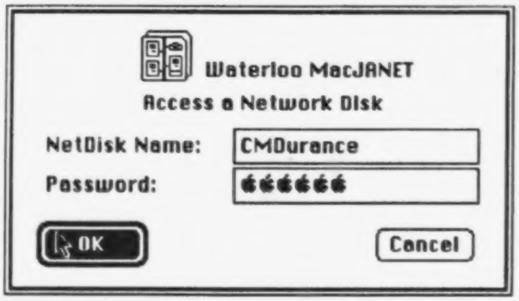

Waterloo MacJANET
Logon...
Logoff
ChngPswd...
Access...
Public Disks...
Cancel
Waterloo MacJANET
Access Public Disks
AppleDisk
NewsDisk
CourseDisk
BASIC
Pascal
WordProcessors
SpreadSheets
DataBases
Access
Cancel

This list can be limited to a subset of all public disks, according to the user's access restrictions. These shared public library disks are accessed in read-only mode, which is indicated by a padlock icon displayed in the title bar of the disk directory window. In addition, Macintosh application files can be marked as protected, so that users can execute an application but cannot copy the program.

Access to private network disks is allowed if the user specifies both the network disk name and an associated password (Figure 7). Each network disk has a read-only and a read-write password.

Figure 7
Accessing a Private Disk


Waterloo MacJANET
Logon...
Logoff
ChngPswd...
Access...
Public Disks...
Cancel

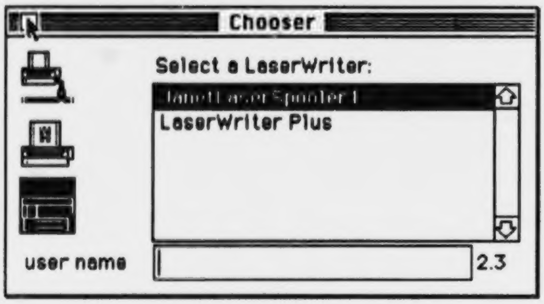

Waterloo MacJANET
Access a Network Disk
OK
Cancel

NetDisk Name: CMDurance
Password: ●●●●●●

Macintosh applications that create temporary work files usually do so on the default disk—typically the disk containing the application program itself. But Waterloo MacJANET uses the startup disk (system disk) in the internal drive of the Macintosh workstation as the default disk even while executing applications. So the temporary work files belonging to the application are created locally on this disk. This has many benefits, but the most important is that it allows these application programs to be shared from read-only library network disks. It also reduces the memory required for a user's private network disk. Finally, using the local disk reduces overall network traffic, thereby increasing network capacity.

Documents to be printed on an AppleTalk-connected ImageWriter or LaserWriter printer can be spooled through the network server. The user simply chooses the name of the network print spooler instead of the actual printer name (Figure 8).

Figure 8
Choosing LaserWriter Spooling

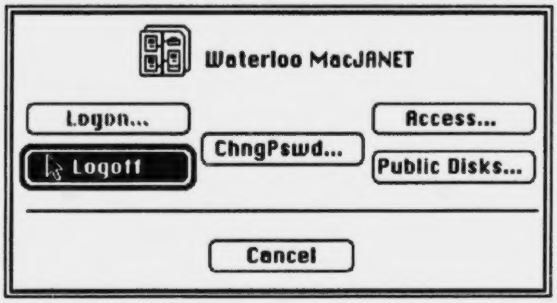

Chooser
Select a LaserWriter:
user name
2.3

JanetLaserSpooler1
LaserWriter Plus

The print data is saved on the network server, and the user is then free to continue using the workstation for other tasks. The network server handles the task of forwarding the data to the printer when it becomes available.

When the user is finished working with the Macintosh, he or she informs the system by using the Waterloo MacJANET desk accessory to log off (Figure 9).

Figure 9
Logging Off Waterloo MacJANET


Waterloo MacJANET
Logon...
Logoff
ChngPswd...
Access...
Public Disks...
Cancel

This releases any network disks accessed during the user's session, leaving the workstation ready for the next user.

Benefits for the User

Waterloo MacJANET offers many advantages to the student user at a workstation.

Files belonging to the individual student are stored on the network server, safe from access by others. The necessity for the student to learn about and handle real disks is eliminated; instead, the student can concentrate on the utility of the computer. Optionally, the students can elect to copy their data to and from the network for personal use.

The system can be set up so that access to other network disks is established automatically when the student logs on. The network disks might contain necessary course-related programs, data files, and news documents. Instant access to the course materials through the network provides the student with the most up-to-date information regarding course assignments and news; for example, an extended due date for this week's assignment or a surprise quiz. Also, the student is assured of using the latest course tools and data files to complete any assignments.

Benefits for the Teacher

In addition to the benefits provided to other users, the network offers special advantages for the teacher, eliminating many of the problems inherent in the computer-intensive classroom of today.

Course work such as assignments, sample programs, and data files can be prepared in the students' working environment. Course materials can also be prepared on a stand-alone Macintosh (for instance, at the teacher's home) and later copied to the teacher's network disk. When appropriate, these materials can be copied to a course network disk, which is shared—through read-only access—by students enrolled in that course.

The ability to provide information instantly to the students yields a more spontaneous teaching environment. For instance, the teacher can react immediately to problems with course materials by offering updates, or by providing new course information as needed.

Teachers can access the individual student network disks to track progress and diagnose problem areas in the course work. They can also use their access to the students' network disks to mark course assignments.

The Administrators' Perspective

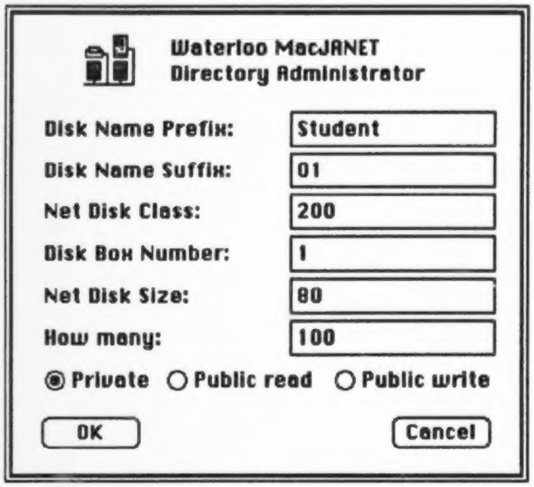
Waterloo MacJANET stresses ease of use not only for the network user, but also for the system administrator. It was designed to be installed quickly and maintained easily. Most administrative procedures can be invoked from a network workstation, in the same way as standard application software.

The Waterloo MacJANET administration program is located on the system administrator's network disk. The program is run from a Macintosh workstation while the network is operational, thus eliminating the need to shut down the system and disrupt other users who are logged onto the network.

The functions that the administration program provides include directory maintenance, manual or automatic generation of user accounts, and collection of user information. Information gathered in the user directory file includes the name of the user, the associated password, the size of network disk allocation, and access restrictions. The system administrator can easily modify the information contained in this file through the administration program, by adding or removing users or by changing the characteristics of current users.

The network administration facilities are designed to cope with procedures peculiar to the educational environment. Users can be added to the network one by one or hundreds at a time in a single operation. Names can be generated automatically from a specified pattern (Figure 10) or read in from a data file for a more customized effect. Each user is automatically assigned a designated allotment of the network server hard disk for private file storage. Users can be grouped into associated classes, and procedures may be performed simultaneously for an entire class.

Figure 10
Automatic Generation of User Names. (In this example, users Student01, Student02, and so on, are created.)



Waterloo MacJANET
Directory Administrator

Disk Name Prefix: Student
Disk Name Suffix: 01
Net Disk Class: 200
Disk Box Number: 1
Net Disk Size: 80
How many: 100

● Private ○ Public read ○ Public write

Furthermore, an individual's access rights can be restricted to a particular network disk or to certain classes of network disks. This added restriction ensures the security of sensitive information on the network disk.

Use at Waterloo

Waterloo MacJANET has been used at the University of Waterloo for more than a year. The production system is actually composed of three separate networks, each consisting of one Macintosh Plus computer with a built-in 20-megabyte HyperDrive hard disk from General Computer Company, and 15 Macintosh 512K Enhanced workstations connected by the AppleTalk cabling system. ImageWriter printers attached directly to workstations provide output.

In Waterloo MacJANET's first year at the University of Waterloo (prior to its release in October 1986), more than 1,500 students used the system in the CS100 computer literacy course. Waterloo MacJANET provided an effective solution to the computer-related administrative and management problems that faced the CS100 course developers.

Reactions of the course instructors, teaching assistants, and students have been extremely positive. The teacher's time is focused on teaching the course content rather than on preparing handouts. Teaching assistants can devote more time to helping students with course-related questions. And finally, students can concentrate on applying the course concepts—with easy access to up-to-date information and software, and without the need to handle disks.

These same principles can be applied to any course using a computer laboratory. Recently, the Engineering Education Research Centre at the University of Waterloo opened a new Macintosh lab using Waterloo MacJANET to provide controlled computing resources for undergraduates, graduate students, and faculty.

Acceptance of Waterloo MacJANET continues to grow in various areas of the university and at many other educational institutions. All seem agreed that it provides a solution to the problem of networking stand-alone Macintosh computers to form a shared teaching environment.

Carl M. Durance

Carl M. Durance is associate director of the Computer Systems Group at the University of Waterloo.

His areas of interest include computer networking and programming languages in education. He has led research and development projects, such as the Waterloo MacJANET local area network, and has designed courses and workshops on networks in education and the C programming language. He has also written books on these subjects.

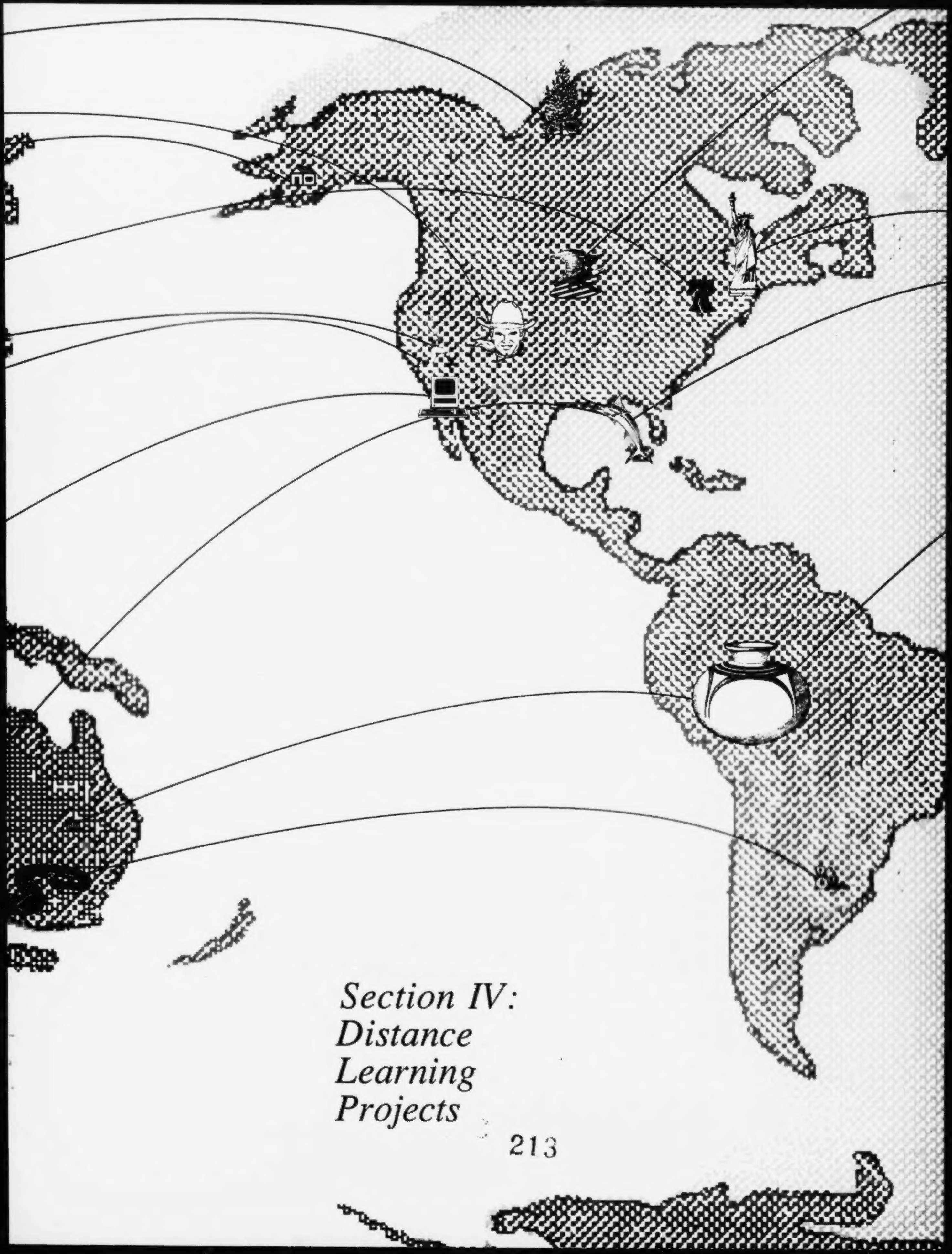
Mr. Durance joined the Computer Systems Group in 1978 after receiving the Bachelor of Math in Computer Science degree at the University of Waterloo. He is currently a candidate for the Master of Math in Computer Science degree.

Shirley L. Fenton

Shirley L. Fenton is manager of project development in the Department of Computing and Communications at the University of Waterloo.

She has been involved in the management of various campuswide computer research projects and the development of several educational software systems. She has developed a number of courses on microcomputer applications and educational networks and has taught those courses in Canada and throughout the Far East. She has also coauthored several articles and books on the use of computer systems in the educational environment.

Ms. Fenton received Bachelor of Environmental Studies and Master of Arts degrees from the University of Waterloo in 1975 and 1977, respectively. She joined the Department of Computing Services at the University of Waterloo in 1978 as a computer consultant and became an adjunct lecturer in 1983. She was appointed manager of project development in 1984 and assistant professor in 1987.



Section IV: Distance Learning Projects

Distance Learning Projects

In these telecommunications projects, multiple technologies have been employed to address the issues of access and equity in education. The three state projects considered here have sought to reach out to their constituents with educational materials broadcast via television, satellite hookups, audio conferencing, and fiber-optic communications, in addition to the computer-based connections discussed in the previous sections. As a result of these hybrid technological configurations, geographically isolated students and teachers are now brought into the mainstream of the educational system. Many innovative projects all over the continent are delivering powerful education programs in nontraditional ways. We present a sampling of them here.

William Bramble describes Learn Alaska, that state's attempt to address remote populations otherwise excluded from a full range of educational opportunities. Beginning with computer conferencing for administrators and computer-based courses for rural high schools, at the height of its development the project grew to include satellite-broadcast instructional programs and video and audio conferencing of advanced-placement and adult courses. Currently, economic limitations have severely constrained full implementation of the system.

As with Alaska's effort to broaden its range of educational services, New York State is directing numerous projects designed to increase participation in the educational process by nontraditional or isolated students. Among its 64 separate distance learning programs, New York utilizes microwave, cable, satellite, and fiber-optic transmissions. Further work with audiographic and computer conferencing contributes to a system that addresses adult literacy, advanced-placement courses in rural areas, staff development, and other areas of concern. As Peter Stoll mentions in his paper, cooperation among diverse political jurisdictions is increasingly important as New York's program expands.

John Southworth provides information on several projects being run in Hawaii to address the need to serve an ethnically diverse and geographically separated student population. Computer-based telecommunications forms the framework for the Hawaii projects, with additional multimedia video and audio components adding depth and interest to student interactions. In his paper, Southworth raises general issues that need to be considered by planners of educational telecommunications projects.

Distance Learning in Alaska's Rural Schools

William J. Bramble

For the last decade the Alaska Department of Education has had a keen interest in using modern electronic technologies to address the needs of schools. In particular it has attempted to employ technology to address the issues of equity and educational quality. A number of approaches have been tried, several of which have involved distance education, broadly defined. The level of success of the projects undertaken has varied, and the intensity of project activity has been subject to a host of political winds and other conditions. When considered as a whole, however, the work provides a great deal of information and insight into distance education.

It is from this perspective that this paper was written. It summarizes projects that have been undertaken in Alaska in the distance education and instructional technology areas. The paper lists some observations from these experiences and identifies issues that need to be addressed in future projects. This paper defines distance education as an instructional process, program, or activity in which the teacher is not physically present with the student at the time of instruction. It discusses project activities and issues that are broader than those that would apply under a definition of distance education that encompassed only formal, for-credit courses, for example. However, the definition chosen for the paper allows for the discussion of techniques that our experience has shown to have a great deal of potential for education and that should receive further consideration.

Background

Alaska is an immense state, incorporating a land area almost 20 percent that of the continental United States. Its geography is rugged. Its climate is often harsh. Its economy resembles that of a developing nation. The largest economic sectors include natural resource extraction, military use, state and federal government, and tourism. Alaska's borders are closer to the Soviet Union than to the continental United States. Its population is small (just over one-half million), yet quite diverse. The majority of its population lives in and around three major population centers: Anchorage, Fairbanks, and Juneau. The balance of the population lives in several hundred small and often isolated communities. Because road systems are limited, transportation of people and goods is often possible only by air or water. Prior to the last few years, communications systems were similarly limited. With the advent of high-power satellite systems, however, communities in the state could be linked by telephone, computer, and television communications.

In this context, providing students high-quality educational opportunities on an equitable basis has proven to be a considerable challenge. The state's 103,000 K–12 students are served by more than 500 schools in 55 largely autonomous school districts. Most of the funding for public schools is provided by the state, at an annual cost of about a half-billion dollars. The average per-student costs, teacher and administrator salaries, building construction and maintenance costs, fuel costs, and other components are the highest to be found anywhere in the nation.

Education in the major population centers resembles that of urban or suburban schools in the lower forty-eight in both organization and quality. In rural areas of Alaska the situation and challenges are in many ways similar to those in rural areas of some Western states. However, there are important differences. A single school district comparable in size to the state of Ohio may include only a half-dozen to a dozen schools; some of the schools in the district may be in villages several hundred miles distant from the district office. The villages are often inaccessible by road, and the K–12 population in a typical village varies from 25 to 150. A small village school may contain only a dozen or so K–12 students and two teachers, who are expected to provide a comprehensive education to students at all grade levels. The population of most small villages is predominantly Alaska native. Many residents follow a subsistence life style that does not fit well with the traditional school-year calendar.

Projects Undertaken

In the early 1970s the Alaska Department of Education began exploring the potential of technology to assist in providing more equitable opportunities to rural school children. At that time NASA and the U.S. Department of Education wished to demonstrate the educational potential of high-power satellite technology in connection with NASA's Applications Technology Satellite (ATS) program. A grant from the National Institute of Education provided a two-year opportunity for the State of Alaska to carry out a demonstration project. The project utilized audio and video communications via NASA's ATS-1 and ATS-6 satellites to deliver instructional programming to students and teachers in remote communities. The results of this project demonstrated that satellite communications have the potential for serving educational needs and for establishing a general communications system that would, for the first time, interconnect the far-flung communities of the state. In the mid-1970s the State of Alaska and the state's long-lines carrier, Alascom, embarked upon an ambitious, decade-long program to install a satellite-based communications system in the state.

At about this same time the computer industry introduced low-cost microcomputers, which appeared to hold special promise for addressing educational needs in the state. In 1977 the Alaska Department of Education initiated a five-year project (Educational Technology for Alaska, or the ETA Project) jointly funded by the National Institute of Education and the State of Alaska. This project addressed educational needs through computer and communications technologies. The three objectives of the demonstration project were (1) to develop and install an electronic mail and data communications system to assist in the administration of public schools, (2) to develop and install a computerized data base of instructional materials and other resources available to schools, and (3) to design, pilot test, and produce a set of ten computer-based courses for students in rural high schools. The project was conducted with the assistance of the Northwest Regional Educational Laboratory. The results of this project were encouraging. Many of the computer-based courses are still used in rural schools. A statewide data communications system is still operating today. Although the original (broad educational) data base has not been retained, the concept of using remotely accessible data bases for more targeted purposes is receiving renewed attention.

A great deal of enthusiasm for the use of computers in education resulted from the experiences of educators with the ETA Project. In the space of a few years Alaska's schools purchased microcomputers until the student/computer ratio reached about 1/15. A more favorable ratio exists in rural schools. Computer usage in classrooms began with rather primitive educational software and instruction in computer programming. Today computers are used in a wide variety of areas. Most recently, interest has centered upon the appropriate use of the computer as a tool in specific curriculum areas such as writing and science.

As Alaska's satellite communications capacity developed in the late 1970s, increasing interest in television was expressed. Many remote communities had no television broadcast service at all. Urban areas in the state received limited service. Cable systems were in their infancy, and the major networks had not transferred their services to satellite. For several years a television demonstration project provided a single channel of video delivered by satellite to 50 or so communities. Time on this channel was divided between education and entertainment. Education was allocated much of the school day, and broadcast instructional programming selected from national distributors. Evening and weekend hours were used for entertainment (and a small amount of public television programming) and provided a mixed fare from the major networks.

As the project evolved, everybody wanted more service. Home viewers wanted a greater variety of entertainment programs. Schools wanted greater access to the channel for instructional uses. Teachers resented pre-emption of instructional programs for sports and special events. There was enthusiasm for expanding the capacity of the network. The concurrent availability of revenue from oil production at Prudhoe Bay enabled the Alaska State Legislature in 1980 to fund the development of a second statewide video channel and designate one for education and one for entertainment.

Learn Alaska Network

Out of this legislation was born the Learn Alaska Network. The network was developed and jointly managed by the Alaska Department of Education and the University of Alaska. It was designed to serve the needs of both K–12 and postsecondary students. An additional priority of the network was to serve the needs of the general public for continuing education, avocational skills development, and information about Alaska and the world. The network was designed to permit flexible use as an instructional delivery system. Thus it included not only a video channel, but also an interactive audio capacity. Data communications networks operated by the department and the university were available to users as well, but integration of the data networks into the instructional offerings was minimal. Ultimately there were 350 audio conferencing sites served by a 140-line audio conferencing bridge in Anchorage and 250 ITV sites fed by satellite and with local distribution by minitransmitter or cable.

The basic services offered on the Learn Alaska Network were designed to meet the needs of three user groups, summarized as follows:

K–12 Education

1. Preproduced ITV series and programs were available from national and international distributors. Individual series varied in length from a few to dozens of programs, and instructional coverage from a few concepts to a full year's study in a particular course area. The great majority of programs were intended to supplement the ongoing program of instruction in schools. Even the longer series did not constitute courses of study in and of themselves, but supplemented the instructional program. Ultimately, more than 3,000 programs were selected for network delivery and broadcast to schools in two ways. A school-day schedule was devised to make programming available on a regular basis for off-air classroom use. In addition, given the widespread availability of video cassette machines in the schools, series were fed in blocks to allow the taping of programs for later use in classrooms at the appropriate point in the instructional process.

2. ITV programming was produced in priority subject areas specific to Alaska—for example, Alaska History, Alaska Geography, Ecosystems of Alaska, Alaska Native Cultures, Alaska Fisheries, Cold-Water Near Drowning, and Alaska Native Claims Settlement Act (ANCSA). Special care was taken to ensure educational soundness of the videos and associated instructional materials. This programming was distributed on the network for both off-air use and copying on videotape cassettes. Because of considerable public interest in some of the programming, it was also broadcast during evening and weekend hours. Since the programming was developed to meet critical instructional needs, it has been especially well received.

3. Interactive programming combining the video broadcast with the audio conferencing network also was provided. Because of budget constraints, this service was produced on a limited basis in subject areas of special interest to K–12 students. These programs provided opportunities for students to interact with personalities not otherwise available to them because of their geographic isolation. Senator Stevens, Governor Sheffield, and members of the Alaska Legislature, for example, appeared regularly on programs in the spring of each year to discuss issues of regional or national significance with students in civics and social studies classes. In a program uplinked from Houston, Texas, students were afforded a preview of the science experiments for the ill-fated "Teacher in Space" shuttle mission. They had the opportunity to question Christa McAuliffe and Barbara Morgan about the mission and the training provided them by NASA. Other programs addressed a variety of topics including homesteading in the Matanuska Valley, Pacific Rim studies, and techniques for student video production.

4. One-way video programming and video programming with audio interaction were produced for teachers also. This programming addressed the needs of teachers for in-service training. For example, one interactive program featured the internationally known "Art Maker," Dan Mihuta, describing techniques for art instruction in elementary schools. Another discussed the use of drama in counseling teenage students.

5. During the 1986–87 school year, we planned to pilot-test the distance delivery to high school students in hard-to-reach areas of credit courses such as foreign languages, higher-level mathematics, and sciences. Such courses appear to offer particular promise to the rural schools faced with the difficult task of providing a comprehensive high school curriculum with only a few teachers. This project would combine technologies including video, audio, computers, and specially designed print materials, each used to its special advantage. The initial pilot test would have uplinked German language and physics courses from Oklahoma State University. The OSU approach to distance education courses is similar to that envisioned by program designers in Alaska. However, budget problems have put this project on indefinite hold.

Postsecondary Education

Each semester the Learn Alaska instructional television network featured 10–12 pretaped university level courses obtained from the PBS Adult Learning Service. The courses covered a variety of areas including art, science, writing, social studies, and others. Credit was individually arranged through the nearest university or community college campus. The participating university instructors varied their approach to using the materials. Some followed the lessons in the videotapes and materials closely. Others made adaptations or added their own emphasis and materials.

A few courses were specially produced by university faculty at the University of Alaska, Anchorage. Courses produced for the nursing and criminal justice programs serve as examples. Yearly enrollments in telecourses ranged from 1,000 to 1,500.

General Public Education and Information

Programs of general informational or educational value were obtained from distributors in the United States and Canada. Areas covered included everything from avocational activities to science, from homemaking to insulating homes in the Arctic.

Programs of specific interest or relevance to Alaska were produced and broadcast where possible. Alaskans had the opportunity to view such events as the Eskimo-Indian Olympics, Inuit Circumpolar Conference Meetings, proceedings of the Alaska State Legislature, governor's impeachment hearings, Alaska Federation of Natives Annual Convention, Burger Commission Hearings on issues related to the Alaska Native Claims Settlement Act, Aviation and Marine Weather Forecasts, and other programs.

Audio Conferencing

The Learn Alaska Network Audio Conferencing Service is often used by itself, without the video network. Educational uses are from the following three areas: (1) direct instruction; (2) support of the instructional process; and (3) administration.

In the university sector the predominant use of this network is direct instruction of students. For the last several years more than 100 courses per semester have been offered through an audio and print mode of distance delivery. In a few courses instructors visit classroom sites on a round-robin basis, and the audio instruction originates from the site where the instructor is present. The instructors are university faculty members. Courses are offered in a large number of subject areas, depending on the availability and interest of faculty and the needs of students at remote sites.

In the K–12 area the use of audio conferencing has been more popular in the areas of support of instruction and administration. Teacher training, professional meetings, seminars, and administrative meetings are common uses. Specific course offerings for K–12 students have been very few and have involved gifted or highly motivated upper-level high school students. Instructional activities outside the traditional curriculum offerings are more common. These include the "Battle of the Books" reading competition, regional Academic Decathlon competitions, and audio conferences with significant personalities (such as a subject-matter expert, astronaut, or author).

The pattern of use that has emerged has led to some additional thinking about the limitations of the medium and how they might be overcome through graphics support. Experience with audio conferencing also suggests appropriate uses for the medium with various subject matter and age groups. The medium tends to be more appropriate for mature and highly motivated students. Subject matter that does not involve a great deal of visual learning is more naturally adapted to this medium.

The Learn Alaska Network Today

Unfortunately, some of the factors that led to the creation of the Learn Alaska Television Network also contributed to its undoing. From 1980 to 1985, the state of Alaska enjoyed a period of unprecedented wealth. By 1985 approximately 85 percent of the annual revenues available to the state were derived from royalties, fees, and taxes levied on petroleum extracted from Prudhoe Bay. With the precipitous decline in world prices for petroleum in late 1985 and early 1986, the state of Alaska found itself in the untenable position of trying to support an expanded number of state programs with a suddenly limited and rapidly declining budget. As part of the overall budget reduction process, the Legislature opted in May 1986 to combine the statewide television networks into a single system. Given the popularity of the entertainment programming, the availability of the network for educational purposes is extremely limited at present.

On the other hand, the Learn Alaska Audio Conferencing Network survives today, partly because of its lower overall cost and the widespread belief that the network offers cost savings in comparison to staff travel. Changes in instructional uses resulting from the closing of the instructional television network have yet to be assessed.

Some Observations about Distance Education

Through this series of projects we gained a great deal of experience in distance education. Much of what we undertook was new, and for many of the activities there were few colleagues or experts to whom we could turn for sound advice. Some things we did well, some not so well. Some problems were anticipated and overcome. Some problems were not anticipated or were never resolved despite our best efforts. But in the process we learned some things that deserve consideration in future efforts of this nature. Much of what we learned had to do with the particular technologies, developmental processes, and operating procedures necessary to carry out the projects. These items are discussed in various written reports. The remainder of this paper identifies broader issues that deserve consideration in the future.

1. The hardware and engineering aspects of communications and computer technologies are better understood and easier to modify than the associated educational theory and design components. Additional sophistication in educational design and development is needed if distance education is to reach its potential. (I should add that we were blessed with an excellent engineering and technical staff, and most of the systems we developed involved off-the-shelf hardware. In a program that involved developing hardware to fit the needs of learners, the hardware issues would be far more complex.)

2. Because hardware and systems are both the most expensive and the most glamorous components of projects, funding agencies and decision makers are sometimes tempted to purchase large systems without a full understanding of or commitment to the ultimate costs of development, operation, and maintenance of the technological and educational components of distance education. We found repeatedly that the cost of technical components and educational product development was but a fraction of the cost of proper implementation and ongoing support. Equipment and communications system services cannot reach their potential without the proper user support. However, we had consistent difficulty obtaining long-range commitments to funding the support elements once the glamor of the new equipment purchase had faded. This is a key challenge for future developers.

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3. Distance education programs should be user-driven and not technology-driven. We were repeatedly approached by vendors or technology enthusiasts wanting to force-fit user needs into a single technology or approach. The problem is that, while one equipment configuration or strategy might address some user needs well, it rarely addresses all needs. We found that the integrated use of several technologies (for example, computer, video, audio, and print) provided a flexible base from which to address user needs. In the design process a key challenge is that of determining the best combination of technologies for a particular educational application.

4. Educational institutions are resistant to change. This is probably true of most institutions and businesses. However, public education institutions, being virtual monopolies, are not motivated to a great extent by market forces. We repeatedly found interest and satisfaction in our activities on the part of students and instructors. The institutional and political responses were not always so positive. For example, while the delivery of distance education courses for college credit has enormous potential for residents of rural Alaska, some of the fledgling community colleges in our rural communities perceived such courses as a threat to their future existence. As a result the University of Alaska had great difficulty expanding the telecourse offerings. Also, when we planned the pilot testing of full-year high school courses in rural schools, the teacher's union expressed concern about potential impact on teacher employment. Public broadcasters in Alaska felt threatened by the department's direct involvement in instructional television broadcasting, even though they placed a very low priority on the activity themselves.

Given this resistance to change and protection of turf, we had our greatest successes in applying technology and distance education techniques that were nonthreatening, that complemented the existing institutions and programs, that fit into existing structures, that made people's jobs easier or helped them to do a better job of what they were already doing. With applications that also involved substantial institutional changes, we were less successful. Some may argue that with appropriate care institutional change is always possible. However, our experience illustrates a dilemma for program developers, who may have to choose between serving organizational goals to ensure short-term success or overall public goals that may lead to greater long-term success. The long-run advantages of distance education will often require basic institutional shifts in both mission and organization.

There is a good deal of public interest in technology and the potential it holds for educating our children. Throughout our projects we enjoyed a good deal of public support. We found public enthusiasm for changes that could help children realize their educational goals. There is evidence as well that technology is changing the very fabric of our lives and the society we live in. It has certainly changed the nature of knowledge and what it means to be knowledgeable. As a result it may ultimately change the nature of education and the educational process. This changing process will provide a fertile area for educational research and development in future years.

5. Rural schools often face major problems in providing quality education because of their small size, isolation, and makeup. Further, it appears that no amount of funding (given reasonable bounds) will overcome the problems related to educational equity if one considers only the traditional labor-intensive approach to education. Our experience indicates that distance education programs such as those described in this paper, while not a panacea, do provide a substantial measure of additional quality in rural schools.

6. Finally, we had some considerable experience in determining cost of distance education components and looking at their reasonableness. A common perception is that sophisticated distance education systems are outlandishly expensive. However, one needs to ask, "Expensive compared to what?" As long as the cost of development and delivery is consistent with the numbers of potential students in the marketplace (that is, doesn't involve a multimillion-dollar system for a handful of students), course delivery can be provided at a very attractive per-student cost in comparison to instructional delivery through traditional means. In evaluating costs it is necessary to look at the cost of distance delivery as an alternative, rather than an add-on, to the existing method of delivery.

Conclusion

I believe the stage is set for distance education to play a major role in American education, especially in rural areas. However, the need for institutional change presents a major hurdle. Insightful political and organizational leadership is needed if students are to benefit from this approach. I look forward to seeing what develops in the future.

William J. Bramble

William J. Bramble, currently a consultant with the Southeast Regional Resource Center in Juneau, Alaska, was in charge of Technology and Telecommunications Programs with the State of Alaska Department of Education. He also served as codirector of the Learn Alaska Network, the statewide program of satellite-delivered TV and audio conferencing.

After receiving his Ph.D. in education from the University of Chicago, Dr. Bramble worked with the University of Kentucky on the Appalachian Satellite project. He is the author of the book Computers in Schools—A Guide for Educators, *published in 1985 by McGraw-Hill. Among other projects, Dr. Bramble has produced several award-winning educational television programs.*

Telecommunications and Distance Learning Systems

In New York State

Peter Frederick Stoll

The telecommunications media offer a significant potential for expanding lifelong learning opportunities at school, at home, and at the workplace. The New York State Education Department's Center for Learning Technologies is exploring the implications of several emerging networks for delivering a variety of educational and cultural programs and services. This paper briefly reviews the current status of New York State distance learning projects and selected statewide collaborative telecommunications initiatives.

New York State Distance Learning Projects

Since 1985, 64 distance learning projects have been initiated throughout the state. Many of the projects were initially designed to provide enhanced courses to rural schools with limited resources. Twelve projects are currently operating, using some form of communications medium to link a teacher and students in one school to students in other schools several miles away. The networks, which typically provide two-way audio and data communications and one-way video transmission, are offering courses such as calculus, astronomy, and second-language instruction. The rest of the planning projects are exploring the potential applications of satellite, fiber optic, cable, and new broadcast technologies.

During the past year, several distance learning projects have begun to explore other applications in addition to the provision of courses. Examples include:

- The use of telecommunications to offer literacy education, retraining of displaced workers, and traditional adult continuing education at easily accessible locations.
- The provision of expanded staff development opportunities through interactive communications systems.
- The use of distance learning networks to increase the participation of nontraditional students in postsecondary education.
- The provision of enhanced access to educational, cultural, economic, government, research, and information services through computer-based networks.
- The application of new telecomunications technologies to expand library and research information services networks.

The 64 projects involve the collaborative efforts of more than half of the state's public school districts. Boards of Cooperative Educational Services (BOCES), postsecondary institutions, and cultural agencies have also participated in the projects.

Several projects illustrate the technologies, applications, and programs that have been addressed by distance learning.

Cable Television

The Pleasantville and Ossining Union Free School Districts, located in downstate New York in Westchester County, are using cable television to offer students Latin language courses. Within each school, a classroom is equipped with cameras, monitors, and microphones. The schools are connected through an existing cable television network consigned by a local franchise. The network provides two-way audio and video transmission.

Microwave

The St. Lawrence-Lewis BOCES, along with three schools located in northern upstate New York, have installed a learning network to deliver advanced placement courses. At each site there is a tower, microwave transmission equipment, and a studio classroom equipped with cameras, monitors, and microphones. Each site is capable of audio and video transmission and reception. The courses delivered over the system are health, shorthand, psychology, sociology, Latin, advanced placement English, and business law. A study is underway to determine the feasibility of incorporating an additional 15 schools within the network.

A second project that uses microwave technologies was begun in 1986 by the Steuben-Allegheny BOCES and several schools in the southern tier region to improve high school literacy, decrease dropout rates, and enhance instructional opportunities. The network uses existing microwave facilities for the transmission of audio and video to remote sites. The transmission of voice and data from the remote sites to the originating site is accomplished through a UHF radio frequency link.

Audiographic Conferencing

The Delaware-Chenango BOCES, in central New York, is using audiographic conferencing to deliver instruction to students in the schools throughout the region. A teacher and students at one location are connected by an AT&T Alliance teleconferencing bridge and a telephone line to students at remote locations. The teacher and students are able to converse with each other using speakerphones. Incorporated within the system at each site are a personal computer, graphics tablet, and modem. The teacher and students can create graphic images using the tablet, or enter information into the computer using the keyboard. The images and messages are transmitted and received by the sites throughout the lesson. Also, the teacher can prepare images and text before the lesson, store the information on software, and transmit when appropriate. Five schools within the Delaware-Chenango BOCES region have received Advanced Placement courses in astronomy and calculus through this audiographic conferencing network.

Computer Conferencing

The Islip Union Free School District 2 and the New York Institute of Technology, located in the Long Island region, are developing a computer conferencing system that offers high school students courses that are not available within their schools. The network links personal computers at remote sites to the New York Institute of Technology host computer facility through normal direct-dial telephone connections or by connecting to GTE Telenet. Computers serve as the sole means of communication, joining individual students in one location to students in another. Students converse with each other and the teacher by electronically transmitting messages entered in the course conference.

Satellite

The Greece Central School District and the Wheatland-Chili Central School District in western New York recently completed a one-year feasibility study of the instructional programs and staff development services of the Texas-Interactive Instructional Network (TI-IN), a satellite-based learning system. The study assessed the capacity of the system for providing adult education, training for local business and industry, PSAT/SAT test preparation, and instruction. TI-IN, a private company, originates televised courses from its studio located in San Antonio, Texas. The lessons are transmitted over the GTE SPACENET II domestic satellite to schools throughout the nation. Each reception site is equipped with a dish for receiving the programs, a television monitor for seeing and hearing the teacher, and hand-held telephones for "talk back."

There are other projects that illustrate telecommunications applications for postsecondary institutions, persons with disabilities, and continuing education.

Postsecondary

Houghton College, located in western New York, linked two campuses that are sixty miles apart via a microwave broadcast system, to offer courses simultaneously at both sites and to reduce staff travel time between the campuses. At each campus, classrooms are equipped with television cameras, microphones, television monitors, and projection screens linked through an interactive television channel, six long distance phone/voice lines, and four intercom lines.

Vocational Rehabilitation

The Resource Center for Independent Living in central New York is studying the feasibility of using telecommunications to enhance access of the disabled to their programs. A potential application of telecommunications is to enable visually impaired and geographically separated elementary school students to collaborate on the production and distribution of tactile art collections.

Continuing Education

The Albany City School District and the Greece Central School District are working with their local public television stations, WMHT and WXXI, to develop a video-based distance learning system for home study pursuit of a high school equivalency diploma. Video programs for teaching reading, mathematics, science, and social studies skills are broadcast by the stations to adult learners. A computer conferencing network offers adults auxiliary instruction and tutoring.

Statewide Collaborative Telecommunications Initiatives

Because cooperation among agencies is necessary to aggregate current and planned resources in support of comprehensive distance learning, the Center for Learning Technologies is pursuing several collaborative telecommunications initiatives at the state level. Several examples are described below.

The New York Network, a program of the State University of New York, is investigating potential uses of their emerging satellite capacity for providing distance learning for the state's public schools, correctional facilities, adult learning programs, occupational and vocational education, and workplace training. The New York Network will install a KU satellite "uplink" capacity. Two channels will initially be available for the transmission of video, voice, and data to remote reception sites throughout the northeastern United States. The center is working with the Network on a pilot demonstration project to create a New York Learning Network employing the satellite capacity to serve the lifelong training and education needs of the citizens of the state.

The New York State Commission on Cable Television is exploring potential applications of cable television for distance learning. The commissioner of the New York State Education Department has supported the commission's proposal to amend its rules on increasing the capacity of channels available for locally originated educational and public service programming. The Center for Learning Technologies and the Cable Commission are assessing the feasibility of expanding local cable access for educational purposes.

The Center for Learning Technologies is collaborating with the Long Island BOCES to capitalize the plan of the Metropolitan Transit Authority (MTA) to install a fiber optic network that might serve schools, libraries, and other institutions of Long Island, Westchester County, and New York City. The Commissioner of the New York State Education Department has requested MTA to allocate cable capacity for the development of a Long Island Telecommunications Educational System. Representatives from the Center, the BOCES, Long Island's two regional library networks, and MTA are developing a network design.

The Center for Learning Technologies, the Massachusetts State Department of Education, the Massachusetts Corporation for Educational Telecommunications, and SUNY College of Technology at Utica, New York, are jointly planning a conference for April 1988, titled "Distance Learning in the Northeast: Access and Equity in the Information Age." The conference will highlight projects that might be implemented across the states. The Northeastern State Educational Agencies will cooperatively develop a "resource book" to provide information on operating projects and sources of technical assistance in the Northeast.

Information Dissemination Activities

Several initiatives were undertaken for providing information to educators, department staff, other state agencies, and industry on existing and emerging telecommunications programs for education and training.

- A computer data base of profiles of the 64 New York State Distance Learning Projects was developed for dissemination to the field.
- In February 1986, a Telecommunications Teleconference was broadcast over the public television system. The Center for Learning Technologies is now producing an updated video program that profiles innovative applications of satellite and fiber optic distance learning projects throughout the state.
- A publication titled *Video Vision* was recently developed to provide New York State schools with information on the instructional applications of video programming, the use of video production as a tool, and distance learning systems.
- A conference titled "Distance Learning Systems: New Windows for Lifelong Learning" was cosponsored with SUNY College of Technology in Utica, New York, in April 1987. Three regional distance learning roundtable workshops will be conducted in the Buffalo, Albany, and Long Island regions of the state this year.

Conclusion

New telecommunications technologies and distance learning systems are rapidly transforming the traditional educational delivery system of New York State, the nation, and the world. The provision of remote instruction across local educational jurisdictions and state borders through satellite communications, direct broadcast television, supercomputer networks, and fiber optic systems transcends narrow institutional, programmatic, and geopolitical boundaries and forges new collaborative relationships among institutions. Several policy and legislative issues have arisen as a result of this transformation process because many of the current laws, policies, funding mechanisms, and regulations do not encourage or support the emergence of a new educational delivery system. The New York State Education Department's Center for Learning Technologies has begun a review of these issues in an effort to develop legislation and fiscal support for collaborative development of telecommunications applications for lifelong learning opportunities.

Peter Stoll

For the past five years, Peter Stoll has served as assistant director of the New York State Education Department's Center for Learning Technologies, working with the department's executive staff to create policy, legislation, and strategic planning. He holds a Ph.D. in Sociology and Education from the State University of New York at Albany.

Dr. Stoll's experience in education has included teaching and administration in both the public and private sectors. He was also project director at the State University of New York Central Research Foundation.

Among his other activities, Dr. Stoll authored the Public/Private Partnership Program adopted as a national model by the 20-state membership of the Software Communication Service. He also produced the public television series The Immigrants—Journey in America.

The Hawaii Global TELEclass Project

and Multimedia Computer-Based Educational Telecommunication (CBET)

John H. Southworth

This paper presents a brief introduction to telecommunications, gives examples of projects already underway, and provides interested educators with information on how they can enrich their own classroom activities through telecommunications.

In the 1970s and 1980s, the field of electronics and telecommunications literally went into outer space. Today, increasing numbers of schools have their own satellite dishes, picking up audio, video, and computer signals from around the world. Unfortunately, while a school can receive such information quite economically, transmitting information is still quite expensive.

For many years there has existed a cheaper mode of receive-transmit telecommunications: the telephone. Telephone-based audio, video, and computer information exchange is much more affordable for educational institutions with limited budgets.

Multimedia Computer-Based Educational Telecommunication

Multimedia Computer-Based Educational Telecommunication (CBET) recognizes the central role of the computer to provide a convenient base for organizing and carrying out various educational telecommunications modes. Generally, CBET involves the use of a computer network rather than sending messages directly to another computer through an ordinary phone call. In this way, messages can be stored in a computer that is shared by many others and is linked to a data network. Such a system permits phone calls that are less expensive than direct-dialed calls to the microcomputer of the person with whom one is communicating. The multimedia and synchronous element of CBET can include a variety of audio, video, or data exchange systems over which a specific educational telecommunications event may take place. Coordination is normally done asynchronously, via computer mail or bulletin boards.

Multimode Node Permits Greater Connectivity

Multimode Node (MMN) telecommunication is a technique for transferring messages, data, or images between electronically incompatible systems. For instance, two computer networks not directly linked can exchange information by MMN techniques of "downloading" from one computer to another and "uploading" that information to another system. MMN linking of audio and computer systems is also possible; spoken information is transcribed into a computer network for subsequent dissemination to persons not able to listen to the original speaker. The reverse process involves reading computer messages into an audio teleconference, or using a facsimile machine or camera to transfer the information visually.

What Are the Basic Types of Computer Communication?

Messages can be exchanged on computers using electronic mail programs, or e-mail (longer messages are often written using a word processing system). Then, after the microcomputer is linked to the central computer network's mail system, the message is uploaded from the file created by the person originating the message. In the reverse procedure, information is downloaded to a disk and can later be edited or printed "off-line" (after the communications link is ended), using the same word processing program. Each subscriber on a computer system has an ID or "username," a nickname that is used when receiving and sending messages.

Sending messages to a group with larger or indefinite numbers of participants is done more conveniently using an electronic bulletin board system (BBS) or computer conferencing system. These systems utilize files that are either open and public to all users on a system, or restricted and private for a predesignated subgroup of users.

Most computer communication systems offer both electronic mail and bulletin board conferencing systems.

Understanding Synchronous and Asynchronous Communication

Synchronous communication occurs when we talk face to face. An ordinary telephone call involves synchronous telecommunication, which is both immediate and interactive. When we send a letter or use computer mail, we're using **asynchronous** telecommunication. The sender and receiver do not need to exchange information at the same time. Asynchronous telecommunication, especially between parties several time zones apart, is generally more convenient. We can send a message or get our computer mail at *our* convenience and know that those sending messages to us and receiving our messages have been able to operate at times convenient to them. You don't "miss that phone call" when using asynchronous communication because the message is recorded by one means or another for later retrieval.

Examples of Multimedia CBET

Examples of Asynchronous CBET

- Project MENTOR (Marine Educators Network to Organize Resources) was an experiment set up in 1981 to provide teachers and students of marine science in various locations an opportunity to exchange information and ask questions via computer mail. Two computer systems were used: the Electronic Information Exchange System (EIES) of the New Jersey Institute of Technology and the University of Illinois PLATO system.

- Project MENTOR included a water-quality data gathering experience based on laboratory procedures for water testing developed as part of the High School Marine Science Studies Program. This program was initiated by the University of Hawaii College of Education Curriculum Research and Development Group. Water temperature, salinity, oxygen content, clarity, and other factors were tested at local sites and posted on computers for comparison by other sites. (The synchronous element of Project MENTOR is noted in the following section.)

  EIES Public Conference 1073, "Science, Math, Technology Information Exchange Network," was used to ask for information about fish, coral, or other marine topics. In EIES computer conferences, items are entered sequentially; each has a CC (Computer Conference) number and an optional Associated Message reference and Key Word title.

- The PLATO conferences ("groupnotes") follow a similar format, except that PLATO permits a parallel message structure. A menu index indicates the original item with the number of comments attached to it. One can immediately read and/or respond to a particular item rather than read through a sequential list of items.

- A poignant example of computer communication on the EIES system involved linking people at a retirement home and youths in a home for persons with cerebral palsy. Using special devices, the young people slowly entered their messages into the computer. Asynchronous communication allowed the completed messages to be printed out with no indication of any physical handicap, allowing them to be judged solely on their content.

EIES developer Murray Turoff told of the shock of visiting face to face with some of his new acquaintances at that home. Not only did he experience the emotional impact of seeing the disabled children, but he was also dismayed that he could no longer communicate interactively with those who could not speak or could write only with great difficulty. Indeed, the computer was the tool that freed these people from their difficulties and permitted greater communication than was possible in a face-to-face situation.

An Example of Synchronous CBET

As part of Project MENTOR, audio teleconferencing took place over PEACESAT, the Pan-Pacific Education and Communication Experiments by Satellite. From the early 1970s, PEACESAT has provided free international audio communication for sites in the Pacific Basin that developed the low-cost PEACESAT ground stations.

Included in the PEACESAT Project MENTOR session were students in Honolulu (Hawaii), Pago Pago (American Samoa), and Wellington (New Zealand). The data gathering took place in June. Figures from New Zealand showed much lower temperature values, an interesting and immediate illustration of the fact that it was winter in the Southern Hemisphere. The Hawaiian and Samoan students, upon comparing dates, discovered they were talking "to tomorrow" with the New Zealand students, who were on the western side of the International Date Line. These dramatic and immediate examples provided concrete illustrations of geography in terms of longitude, latitude, hemispheres, seasons, and time zones.

Data from Florida, which was not within the range of the PEACESAT system, was transmitted via EIES and was shown on overhead transparencies in Honolulu. It was dictated to the Samoan and New Zealand students for completion of their water-quality charts. A high salinity figure for the Pago Pago harbor led to a discussion of the possible reasons for the result. It turned out that the data had been collected next to the fish cannery, which uses a lot of salt in its processing. Runoff went straight into the harbor. This and other concrete examples promoted environmental awareness. The Samoan teacher participating in this project repeated the activity with students in subsequent years, and similar salinity values were found. The data resulted in the denial of a permit to expand the cannery, based on the environmental impact demonstrated by the students' figures.

The Hawaii Global TELEclass Project: A Model of Multimedia CBET

In September 1985, the first international teleconference of the Telecommunication Enriches Language Experiences (TELEclass) Project took place. Students of Hawaii's Castle High School Japanese class interacted with English language students of Tokyo's Gakushuin School.

In the past two years, about 100 TELEclass sessions have been held, involving secondary school students in Hawaii and their counterparts overseas in Japan, Korea, Taiwan, Hong Kong, People's Republic of China, Canada, Puerto Rico, Tahiti, Spain, France, and Germany. In that time, much was learned, not only about the technical aspects of "linking" students on a global scale, but about factors relating to cross-cultural differences and contrasting school systems.

A typical TELEclass session begins with an exchange of greetings from each side, a set of questions and answers, an open forum for additional questions, and closing comments and thanks. The session is bilingual—a Hawaiian student asks a question in the target language and it is answered in the target language by a student overseas. That student then asks a question in English and the Hawaiian student answers it in English. To help students get used to the technology, beginning scripts have been prepared, so each student can read the question in the target language and is prepared with an answer in his or her native language.

Besides the use of slow-scan TV, video enhancement is provided through the use of duplicated color slides or videotapes. Typically, students develop a set of 20 to 30 slides of their school, the community, and student activities. These are duplicated and a copy is sent overseas. The presenting school retains a set to show simultaneously. Through ordinary audio TELEclass techniques, the students narrate the slides in the target language and questions are asked by the viewing students. It is important that slides be shown simultaneously at both sites for reference as questions are asked. Slides are both inexpensive and easy to use in terms of editing and pacing. When questions are asked, a longer time can be spent on individual slides as necessary.

TELEclass began as a multilevel program to enhance the learning of foreign languages. It was organized in the following stages:

Level 1: Introductory matching of schools with common areas of subject matter. Introductory exchange of materials between schools. Planning for equipment acquisition and for subsequent levels.

Level 2: Telephone conversations. Students use speakerphones that permit groups of students at each end to listen. For TELEclass language experiences, an introductory script (in English and Japanese, for example) provides a helpful guide for students in both locations. Visual enhancement is possible at this level through the exchange of duplicate sets of color slides that show the school, its students, the town, and the local area. These are shown at both locations during the session, with dialogue and subsequent questions exchanged over the speakerphone.

Level 3: Electronic mail. Through electronic mail on central computer systems linked by long distance communication, it is possible for students to write electronic "pen pal" letters back and forth. The computer mail and conferencing (TWICS Parti TELEclass/Japan file) permits convenient planning for the telephone and other live TELEclass activities. (NOTE: As computer communication becomes more and more accessible to schools, it is expected that this level will become Level 1 and will be the launching point for TELEclass participation by interested schools.)

Level 4: Videophone. While full-motion, interactive television conferencing is quite expensive (especially on an international scale), the use of slow-scan or freeze-frame television is possible over an ordinary telephone line. SSTV activities using Colorado Video or Lumaphone equipment have been popular modes of TELEclass exchanges.

Level 5: Student and/or teacher exchange. Students who have become acquainted through TELEclass telecommunication projects are able to meet face to face, participate in direct learning experiences, and see each others' culture firsthand.

CBET Basis of TELEclass

TELEclass is based on multimedia Computer-Based Educational Telecommunication (CBET), which involves the use of central computer communication to coordinate the project. In Hawaii, all schools have been linked through the University of Hawaii DEC20 computer mail and electronic bulletin board systems. These systems have been the basis of communication between TELEclass schools and project staff. The project has been facilitated by a partnership with Career Kokua, the Computerized Information Delivery System (CIDS) that has placed computer terminals and phone lines in each of the high schools in Hawaii, providing easy access both to the computer network and to inexpensive Radio Shack Duofone 101 or 102 Speakerphones for audio TELEclass sessions. Thanks to the cooperation of Colorado Video Corporation and Luma Telecom, Inc., video enhancement has been possible through slow-scan television and equipment loaned to the project.

Expanding Partnerships

Through the use of international computer networks, TELEclass coordination has been facilitated between Hawaii and overseas sites. EIES has been the main system used for such communication. During a trip to Japan, Korea, and Hong Kong in December 1985, it was possible not only to coordinate the TELEclass sessions between those countries and Hawaii but also to document the events in one of the computer conferences on EIES. This technique has permitted dissemination of TELEclass activities, with a view toward the time when the scope of participation can be broadened.

An MCI Mail/Telex connection has been invaluable, especially with TELEclass contacts with Shanghai Teachers' University, which has been the local coordinating agency in Shanghai. While telephone contact there has been difficult and of marginal quality, the MCI Mail link has been both convenient and reliable in coordinating TELEclass exchanges.

Recently, Simon Fraser University (British Columbia) and TWICS Beeline (Tokyo) computers have been added to the network. It is hoped that development of the Global Students Network system will provide further support for TELEclass CBET activities.

The National Association of Laboratory Schools (NALS) has a network on the University of Michigan Confer 2 system, and is planning to explore expansion of TELEclass to other parts of the U.S. Further U.S. development is expected through a Phi Delta Kappa District 2 grant to explore TELEclass interstate activities in schools sponsored by local PDK chapters.

A special example of the international possibilities of CBET has been the experience of TELEclass at the last two Second Language Institutes at Kalani Honua Conference Center in Hawaii. At the Institute, up to 100 persons gather annually to immerse themselves in a foreign language for a week, residing in the Japanese, French, Spanish, or Hawaiian house. Each year TELEclass sessions have been included, both to extend contact and to provide for various computer, audio, and video telecommunications experiences for the institute participants.

In 1986, the French House decided to hold a bridged teleconference with French-speaking people in France, Louisiana, and Quebec to allow the participants to hear different French accents in real time. In addition to contributions from members of the French House, representatives of each of the other languages studied at the Institute gave short greetings. It was a moving and historic moment to observe Jean Keale, principal of the Ni'ihau Elementary School, give a prayer in Hawaiian. (It was subsequently translated into French.) She spoke regally, totally absorbed in her task and moved by the opportunity to share her Hawaiian language and culture with other parts of the world. She noted that she also hoped the day would come when students on the isolated and privately owned island of Ni'ihau—where they don't even have telephone service—could benefit from such experiences.

Future Alternatives

As TELEclass continues into its third year, there is great interest not only in utilizing many of its current elements but in moving ahead in new technological and curricular areas.

Now that the basic techniques have been tested and confirmed, it is hoped that greater attention can be placed on alternative curricular approaches to audio, visual, and computer TELEclass activities. Greater emphasis is planned on teacher and student training in the use of the computer network and speakerphone equipment. Various "school partnership" agreements are being considered to provide for both funding and coordination assistance, and should permit more schools to participate.

One such example is the previously mentioned grant from Phi Delta Kappa's District 2. The intent of this grant is to test the applicability of TELEclass techniques among U.S. schools. If successful, other PDK District grants are expected that could lead to a national TELEclass network.

Another type of partnership has been exploring the introduction of TELEclass to Russian language and cross-cultural experiences. The Initiative for Understanding program sent a group of Hawaiian students to the Soviet Union during the summer of 1987. The Hawaii Initiative program coordinators are working closely with TELEclass to investigate the possibility of utilizing such telecommunication links with students in the U.S.S.R. In July 1987, a Moscow–Honolulu demonstration of TELEclass audio communication took place; this was the first linking of these Hawaiian students with people in the Soviet Union.

The Hawaii Department of Education is studying the possibility of extending TELEclass techniques from its start in the area of foreign language instruction to social studies, art, music, and science. That direction could involve NALS schools around the country, encouraging them to interact among themselves as well as with schools overseas. When this is achieved, TELEclass will enrich learning as well as languages.

Discussion is underway of methods for developing a TELEclass subscription that could include various elements of (1) computer access/equipment, (2) audio/video equipment, and (3) telecommunications costs.

Establishing an Educational Telecommunications Program

As many educational administrators already know, establishing a new telecommunications program involves several diverse technological and financial issues. Some of these are discussed here.

Despite the fact that narrow-band telephone technologies currently represent the most economical forms of telecommunication, you should first survey locally available resources.

- Is there an existing audio/video/computer resource that will provide an upscale entry into the field of telecommunications?

The PEACESAT network in Hawaii, using the ATS-1 (and later ATS-3) satellites, is just such an example. The previously described Project MENTOR water-quality data exchange took place internationally at no cost using PEACESAT. Ironically, at that time it was easier (and less expensive) to hold international teleconference activities for Oahu students with students around the Pacific Basin than it was to do so with students on the neighboring islands of Hawaii. The latter required long distance phone calls! Interisland activities have been possible only since TELEclass began.

- How good is telephone access?

While new forms of multiuse (audio, video, and computer data) cabling are being developed, the present key to low-cost telecommunication is the ordinary phone line. Ideally, each classroom would have a phone jack to which the modem or speakerphone could be attached. This approach should be the plan for any schools being built or renovated, to allow best flexibility to participate in CBET.

For the present, the most pragmatic approach would be to identify an existing line to which a phone jack can be added or, even better, to install a new line that has one or more outlet jacks for the use of telecommunications. (Note: An ordinary line can be used for standard telephone conversations when not being used for telecommunications.)

It is important to determine whether the phone system is the electronic or regular type. Most existing speakerphones and other kinds of telecommunications equipment that are primarily designed for ordinary two-wire communication do not work on the new electronic phone lines without special adaptors. Ideally, simple interfaces between regular lines and electronic lines, or switchable telecom equipment operating on either type, will be developed. For the time being, let the user beware.

- What if I do have an electronic phone system?

The best plan is to arrange for a "bypass" of one of the lines for use directly with telecommunications systems. Be sure that modular jack capability is provided so that speakerphone, SSTV, facsimile, or computer equipment can be easily plugged in and out.

- Where should the phone jacks be located?

If having multiple-access jacks in all classrooms is not possible, then the logical locations would be multiple-use facilities such as the audiovisual center, library, or computer lab.

- What if I need a speakerphone?

The speakerphone is one of the easiest to use and most important devices for developing good synchronous telecommunications techniques. Speakerphones range from simple ones like the Radio Shack Tandy 101 or 102, costing less than $50, to more elaborate systems with various options that cost hundreds of dollars (Darome or Westell conferencing systems, for example). Some new phones come equipped with speakerphones. (Note: If the loudspeaker volume is limited, the use of an external microphone and speakers is helpful in a large room or in noisy conditions.)

- What are some considerations in using video telecommunications?

The use of video in multimedia CBET can take several forms. For example, printed and photographic information can be duplicated and sent by mail ahead of time. Schools often make up packets of information (written and visual) about their school, students, and community. These can be the bases for discussion at subsequent synchronous audio events or during ongoing asynchronous computer communications.

Videotapes are dynamic and excellent resources to show either before or after an audio session. However, different international video standards (such as PAL and NTSC) may require converting tapes for use on local equipment, causing considerable frustration and incurring high costs. Additionally, it is difficult to ask questions about a specific frame or subject in a video or film. Editing of videotapes is time-consuming and difficult if adequate equipment is not available.

The use of 35mm slides provides an extremely convenient method of introducing the visual aspect of a subject. During Project MENTOR, slides showing students at one school constructing papier-mâché models of islands were made, duplicated, and distributed to the other sites. The students who made the models commented on the step-by-step process as each slide was locally projected.

In 1982, NASA provided teachers an opportunity to borrow moon rocks that had been collected during the Apollo Mission. First, however, each participating teacher had to be trained through a NASA Moon Rocks Handling Training Session. Normally, these sessions are given at regional NASA educational centers. The center closest to Hawaii was in California, and thus required a financial and time commitment. NASA was contacted and agreed to conduct a remote moon rocks certification training program for teachers in Hawaii via multimedia teleconference.

Appropriate printed materials, slides, and videotapes were mailed ahead of time. Slow-scan television (SSTV) and a speakerphone were the synchronous elements. SSTV equipment provided by Colorado Video, Inc. linked the 40 Hawaii participants with the NASA education center in Washington. After a welcome from NASA and an exchange of pictures, the Hawaii group looked at the videotape and slides. During the question-and-answer session that took place via SSTV, the NASA official showed an actual sample of moon rock. The teachers who were certified became eligible to borrow moon rock samples for use in their classrooms. Several thousand dollars were saved, not to mention the personal time of the participating teachers and the training staff, who did not have to leave their own laboratory.

Increasing opportunities for full-motion, satellite, or microwave multimedia CBET are developing. The low cost of "receive-only" dishes makes picking up signals an increasingly popular option in teleconferencing. Normally, because having an uplink is so expensive, these involve one-way broadcast TV and two-way phone audio links.

NASA and Creighton University coordinated multimedia CBET links during the 51D NASA Mission. Full-motion TV and computer networking were the prime modes of the teleconferencing. Local schools in Hawaii were linked with the University of Hawaii computer, to which conference items were transferred via a computer on the mainland. Local school groups came to the University of Hawaii to watch live sessions as well as those recorded and transmitted via satellite. Delays in tuning the satellite ground station in Hawaii necessitated linking via SSTV during the opening teleconference. Ellison Onizuka, Hawaii's first astronaut, was in Hawaii during the 51D Mission. His remarks and image were beamed by SSTV to a school in Wisconsin, where Colorado Video SSTV equipment was installed. The first high school in Hawaii to have a satellite dish obtained it as a result of their participation in the 51D Mission Watch teleconference and their subsequent enthusiasm.

- How can I introduce video techniques at low cost?

The amount you spend for video will depend on your budget and on available resources. The basic low-cost approach is to use printed pictures or color slides. For example, a set of 20 to 30 slides is adequate for a 30- to 60-minute program. These can be easily duplicated, numbered, and sent ahead of time. Students from the originating site then prepare the dialogue for the slides. Easy editing (you just pick and choose), low cost, and the ease of stopping for questions and answers are advantages of using photo or slide video programs.

Videotapes, as mentioned before, can add a dramatic element but are best used outside an actual teleconference. Some schools have limited editing facilities and, in dealing with international video exchanges, there may be problems in converting between PAL and NTSC standards. (Note: The investment in a VCR with PAL/NTSC capability might be worthwhile, saving conversion costs, frustrating delays, and inability to view tapes made overseas.)

- What kinds of on-line video can be used?

On-line video ranges from full-motion to freeze-frame SSTV. The latter ensures low cost and allows for use of the equipment from almost any location that has a telephone and modular jack arrangement. Examples of companies manufacturing SSTV equipment are the Mitsubishi-owned Luma Telecom of California; Colorado Video, Inc. (CVI); and Photophone of Texas. At the time of this publication, the basic Luma system is less expensive, lighter, and easier to use than the others but has limited teleconferencing capabilities. CVI and Photophone produce more expensive equipment, but allow greater latitude of telecommunications and teletraining possibilities.

Luma is working on a project to use the Lumaphone with police data banks to quickly distribute photos of missing children. Colorado Video maintains a network of CVI SSTV equipment users called Scan Net that encourages self-initiated, cooperative video teleconferencing around the country and to a few international sites. Photophone has been using its equipment to link remote Eskimo villages in Alaska with central health facilities in more urban areas to provide for emergency and routine health care.

Facsimile ("fax") is a capability with growing potential. It basically involves copy machines linked through telephone lines. Just about anything that can go through a copy machine can be sent via fax. Although fax has been around for years, it is only recently that the price has dropped below $2,000 for a basic system, making fax practical for schools to use. As businesses begin to make this a standard item of equipment, schools might establish a partnership with a local company to utilize its fax machines until they can obtain their own. In Hawaii, each Department of Education District Office has fax capability, but few local schools have the equipment. An early TELEclass event between schools in Honolulu and Tokyo was made possible by transmitting the script through a Japanese golf store that had fax capability in both its Honolulu and Tokyo outlets. It appears that the growing use of computer graphics, facsimile, and other video systems holds great potential for multimedia CBET projects.

- Does the state or university provide a full-motion ITFS (such as HITS, Hawaii Interactive Television System) that is subsidized to permit free or low-cost telecommunications?

The use of full-motion television will undoubtedly continue to grow, as will opportunities to participate in distance learning and teleconferencing. This will generally become economical when large audiences can share the high costs of renting satellite systems. On a more local (and lower-cost) scale are microwave systems such as ITFS (Instructional Television Fixed Service). In the fall of 1987, the Hawaii Interactive Television System (HITS) will begin statewide full-motion programming of courses and teleconferencing on a one-way video, two-way audio basis. HITS will be able to involve interstate or international programming by interfacing SSTV or satellite TV systems for special programming.

Development of educational consortia is expanding to allow shared use of satellite TV channels by groups for course delivery and teleconferencing. This approach will grow, but potential subscribers need to compare their distance learning or teleconferencing needs with the types of service provided by the various consortia and commercial systems.

- What about computer network subscriptions?

There are several dozen commercial, private, educational, nonprofit, and individual computer networks. They range in scope from very small systems (a single microcomputer with a modem and phone line that serves one user at a time) to large international systems (a mainframe computer attached to a communications network, with ports allowing dozens of users to be on-line simultaneously).

Individual schools and computer stores often start with a small system. The advantage is that a small system is usually free or very inexpensive. The main drawbacks are that such a system is limited primarily to local users and does not support simultaneous, multiple use.

For global (or at least interstate) computer telecommunication, it is best to use a system that is linked to a network with many local nodes, in which a local phone number can be called to access the network. In such a case, you usually pay for the network charges ($3–20/hour for various systems in the U.S.) as part of the charges billed by the computer electronic mail or bulletin board system used. Examples of data networks are Telenet, Tymnet, and USnet. Host systems such as EIES, CompuServe, The Source, Unison, MIX, NWI, Confer 2, and TWICS Beeline maintain links with one or more data networks. The subscriber then gets an invoice for monthly data network charges plus charges for use of the computer. Rates range broadly and involve a variety of charging methods. Most provide both electronic mail (e-mail) and electronic bulletin board systems.

The choice of a network depends on (1) whether there is an ongoing or special event of personal interest taking place on the system, (2) whether you want to link up with a certain party already on the network, and/or (3) whether the cost to use the computer fits into your budget.

If you plan to use computer networking, then a terminal or microcomputer with a modem is required, as is a communications software package to interface the microcomputer with the computer network. Help in these matters is best obtained from an acquaintance already participating in a network or from a communications subcommittee of a local computer users' group.

Conclusion

This paper has been written to stimulate thinking and planning among local educational distance learning and teleconferencing planners and teachers. The pragmatic approach to using available resources permits educators to take different paths to enter the field of telecommunications. These examples of educational telecommunications should help point the way to a new age in education. The multimedia CBET concept of starting with computer networking will greatly help in planning, executing, and keeping up to date with current resource developments and systems.

Multimedia CBET is easily adaptable to any curricular area. It is the motivation, imagination, and creativity of the teacher that will determine who and what can be featured via telecommunications to enrich the educational environment. The natural intelligence of the teacher, rather than the artificial intelligence of hardware or software, will determine the quality of telecommunications and the extent to which it will become part of the world of learning. Don't wait, or you'll miss your chance to be a pioneer in global education!

John Southworth

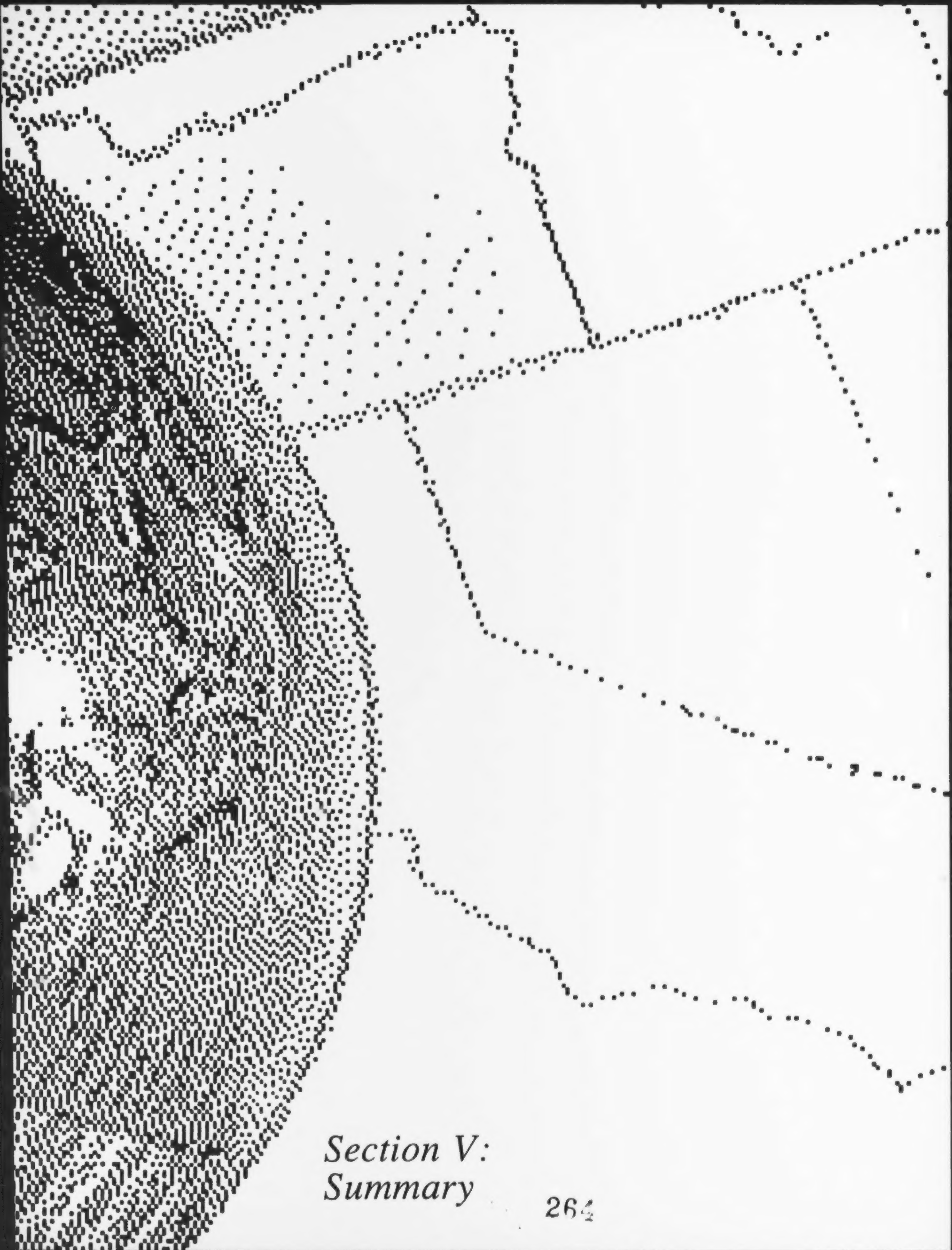
John Southworth is an educational associate with the Curriculum Research and Development Group (CRDG) of the University of Hawaii College of Education. Since September 1985, he has been senior investigator for the Hawaii Global TELEclass (Telecommunication Enriches Language/Learning Experiences) Project in Hawaii.

Mr. Southworth was recognized by Scholastic, Inc. Electronic Learning as one of the Electronics-Using Educators of the Year in 1984 "for significant contribution to the advancement of education through technology."

He holds a B.A. in chemistry from Pomona College and an M.Sc. in oceanography from the University of Hawaii. He taught science and math with the Peace Corps in Malaysia. In recent years he has taught chemistry and technology courses at the University of Hawaii and the University Laboratory School. He pioneered the field of *multimedia Computer-Based Educational Telecommunication (CBET) and Multimode Node (MMN) transfer of information between electronically incompatible systems.*

In 1979, he was invited to become a member of the Electronic Information Exchange System (EIES). He continues today as moderator of ongoing EIES computer conferences on religion and technology, computers in education, and science/math/technology. He also uses regularly NSI, Simon Fraser (Vancouver), TWICS Beeline (Tokyo), McGraw-Hill MIX (Minneapolis), and PLATO computer communications.

In September 1987, he began a one-year project working on development of the educational telecommunications plan for the Hawaii State Department of Education.



Section V: Summary

Session Notes

During the Education Advisory Council conference, participants had the chance to exchange ideas and concerns about the present and future of telecommunications in education. Council members concurred that telecommunications could augment education in many arenas, but that there are obstacles to overcome before its widespread use will be accepted. The following article by Larry Vaughan is a synopsis of the issues raised during the breakout sessions at the conference.

Visions of the Future

Considerations for Shaping Educational Networking

Larry Vaughan

Introduction

When the Apple Education Advisory Council met in September, 1986 and contemplated issues around future networking, the discussion was more than just an exercise in guessing what things will look like down the road. Sure, it's true that educational administrators don't have a handle on current technological networking opportunities. And, yes, it's also true that only a very small proportion of administrators are using electronic networking at all; and most of those users are underutilizing it. The fact is that the vast majority of educational administrators are either unaware that networks exist or have no idea what they might gain by using them. Even the Advisory Council members with our broad-based experience in networking had trouble reaching consensus views about existing networks.

If all this is true, then why fuss about future networks for educators? Because even though we don't have all the answers for existing networks, we've got to start sorting out what we want the future to look like, if we hope to have any chance of shaping it.

We can agree on some things. Access to good information is essential to good decision making in educational administration or any other arena. The sheer volume of information is overwhelming and increasing in geometric progression. Educators, particularly administrators, are isolated and need to make independent and informed decisions. Educators need some kind of system to share information.

Educators are not alone in considering the future of networking. Clear vision has not yet resulted from ongoing consideration of dilemmas in the corporate networking world. Recently Stuart Mathison, vice president of special projects for Telenet, said, "Last year we agreed that the industry's biggest challenge was to turn mailbox subscribers into users. According to industry reports, this is still our biggest challenge." But in a recent study conducted by Dataquest on why people want to participate in electronic networking, the following were the most frequently cited reasons:

• Information sharing	45%
• Data base access	24%
• Mainframe access	17%
• Exchanging data	17%
• Electronic mail	10%

I'll put money on the proposition that educators' reasons for wanting to connect are quite similar to these. Educators interested in electronic networking want to get information from peers who can help them in their own decision making. Before we become too worried about turning subscribers into users, however, we have to demonstrate what benefits educators can expect to derive from networking and then persuade them to subscribe.

The Advisory Council's deliberations about the future had to get down to the basics. We knew that the who, what, when, where, why, and how of future networking were important. The "who" seemed fairly clear: Administrators must demonstrate the utility of networking so that its function would become legitimate and be budgeted before networking could become more widely available to the larger educational community. The council also had some overall consensus on the "what"—information for decision making. The "when" seemed to be derived from the frequency of the need—probably daily in the future. I agree with the several Advisory Council members who insisted that the "where" had to be right on the administrator's desk, and not only on his/her secretary's desk. The "why" seems to be related to general information sharing aimed at decision making. Although the "how" is much less clear, everyone agreed that networking must be very easy (superfriendly with transparent access to multiple networks).

Before laying out specifications for future educational networking, the council addressed some other general issues. Educators and administrators should be planning how to network people, not technologies. If we can develop a clearer vision of the issues involved in networking people, the technology can be developed to address the vision. We must take risks, pilot new networking applications, evaluate the use of networking, and take these lessons forward into the design of future systems. All future-oriented models of networking must be process models so that future systems can readily be redesigned as we are building them.

As is now the case, costs will be a major consideration in the future. However costs shake out in the future, they will not be easy to justify if the networking services do not make the educational administrator's job easier and allow the generalized perception of increased effectiveness. Also, it is likely that we have the wrong financial models to support educational technology development programs. We need to reallocate and create new resources (human, technological, fiscal) in order for education to provide for this development.

Much of the discussion of the Apple Education Advisory Council meeting about future networking could be categorized within the following topics:

- Technical considerations
- People considerations
- Human/technology interface considerations
- Network utilization

These issues are discussed in the sections that follow.

Technical Considerations

Will future networks be multimedia configurations that coincidentally capitalize on graphic images, sound, and text? How might these multimedia configurations influence our use of networks in the future? What can we do now to effect a smooth transition from current technologies to those in the future? We must plan to provide support of the evolutionary steps between today's and tomorrow's technology while effectively serving the current installed base of network users. Can we envision an overall communications system instead of partitioned components (voice, images, data)? How can technical considerations be managed to minimize cost-versus-use limitations? Future technology in networking must provide for:

- Seamless movement across networks
- Standardization in user interface
- Simplicity in use (telephone analogy)
- Cross-hardware compatibility
- Access and control of information
- Minimization of training needs

People Considerations

How can we demonstrate to leadership (those in charge of authorization and appropriation) that networking makes a difference? Can increased awareness lead to pilots, acceptance, and replication? How can we assure that training needs are minimal, and that training will always be available to break through "the wall" of the learning threshold? System design should eliminate the need for training on how to operate hardware and software so that training can focus on the realm of the possible: What are the ways we can use networking to solve problems? How can we come to understand the global organizational and human change processes necessary to implement the vision of educational transformation? How can systems be designed to induce creativity in networking practice? Do we need intelligent systems that can manage and/or control the flow of information? How can future systems empower educational leadership? For future networks to be effective, they must be designed to:

- Adapt technology for education
- Serve multiple levels of decision making
- Relieve impacts on the schooling process
- Make human expertise more widely available
- Protect original sources of information
- Allow sufficient security to protect people and institutions

Human/Technology Interface Considerations

Ease of use will promote further utilization, but how can the interface be standardized across information sources and hardware? If most educators don't understand technology and most technologists don't understand education, how can we bring them together to establish useful interface protocols? Humans and institutions (particularly educational ones) tend to resist change; how can training overcome this resistance? We must work effectively to design systems that:

- Appear totally transparent to movement across subnetworks
- Are as easy to use as telephones
- Do not create fear among intended users
- Present a low-risk method of information support
- Provide a cost-effective alternative to present communication methods
- Can help us filter the flood of information

Network Utilization

If people don't use effectively the networks that exist today, how can we expect them to use future networks effectively? How can we demonstrate the needs persuasively enough to assure the level of use that is necessary to make a broad-based network effective? Costs, both startup and ongoing, inhibit use today—can we overcome this problem in the future? To move toward an appropriate level of utilization in the future, systems must be designed to:

- Self-validate their utility and usefulness
- Provide a universal standard interface
- Be viewed as a process, not a product
- Empower the user
- Provide desirable cost/benefit factors
- Lead humans to better decisions

While the members of the Apple Education Advisory Council covered a lot of turf in discussing future networking for educators, we barely skimmed the surface of the topics that were identified; and we are certain that we failed to identify many areas that will be pertinent to the design of future systems. As one member of the council said, "The nature of knowledge and knowing has changed, and we haven't adjusted yet." We must come to grips with that in the future. We have many dilemmas. For instance, reaching short-term goals involves operating within existing structures, while reaching long-term goals involves putting energy into a process that may be counter-productive to short-term goals. We must come to think of information as dealing with the dynamic rather than the static. We don't even have a metaphor for how we really want to be linked. What is the nature of the gateways that must be created to make our networking really useful? What user-generated data bases are needed to maximize utility? Politics exist in every arena, and will certainly have a major impact on the design of future networking solutions for education. How will politics influence integration and expansion of curriculum for our schools?

Surely, we are now witnessing the shrinking of the world, but not of its base of information. What issues must we consider about access to and freedom of information? When can we expect the educational community to understand the networking medium? What are the major ethical considerations? Are we misleading ourselves; are networks just tools in search of a task? How can we overcome the pervasive fear of information-sharing utilities? Is there real utility or just romance? There is a perceived designer-versus-user conflict, and we must bridge the gap.

I think the council left Cupertino with the feeling that it would be possible to build road maps toward solutions; it will take leadership, compromise, and actual networking among educators. The leadership will have to create, support, and disseminate multiple models and pilots of what can work. Leaders can sense needs and get an endorsed vision of what the educational community wants. They can look to business to learn of the successful models used there and use these models to influence development in education circles. We will have to compromise with all of the stakeholders.

Standards must be set. We will have to learn to accept, even welcome, a dynamic environment. Full development must become a distributed process. To develop networking we must network. How can we create widespread access to a variety of models? How can we stimulate interaction between the producers and consumers of networking? Can we learn to become our own producers?

As we reflect on the promise of future networking solutions, we must admit that there is a dichotomy between technology that exists, which we don't use well, and technology that doesn't exist, which we need. All of the problems of present and future networks are problems because they limit who can participate and at what level.

Not everybody is ready for networking. Many can cite the benefits of networking, but some of these same people are not yet using it productively. What is the answer? How do we go about building the kind of perspective we want educators to have? Today, I think experience is the only answer. Sometime, at some point, a bulb is lit and someone says, "Aha, I could do this with that." All of us need more "aha's." Let's expand our horizons.

As I write this manuscript, pilot projects are underway. I am personally involved in two such projects that connect groups of superintendents in the New England area. It is clear that these projects are changing the way superintendents look at their work. Project participants are using the networks to advertise professional vacancies, ask for help on curriculum issues, seek guidance from their peers about policy issues, and check out the general educational climate relative to specific issues. Such information access is long overdue. The experience and insight we all gain through this and other bold pilot projects will influence our visions for educational networking.

Commentaries

Charles Blaschke is an active participant in the field of technology in education. He has been a consultant to some of the projects discussed in this book. Mr. Blaschke's involvement in the planning and execution of numerous computer-based systems provides him with an overview of the issues surrounding telecommunications in education. His commentary here stresses the need for new ways of looking at political, economic, and jurisdictional boundaries.

Gerri Sinclair is a networking "evangelist" with experience in computer education. As a teacher, she has enabled young people on several continents to communicate with each other through computer-based telecommunications. Ms. Sinclair's various educational networking projects have linked children and adults all over Canada, the United States, Japan, the Soviet Union, and other countries. In her essay she proclaims the joys of "net riding" and describes the real-world promise networking holds for contributing to the hope of world peace.

Networking in Education

The Need for Managerial and Political Innovations

Charles L. Blaschke

Introduction

For a society so adept in developing technology, we have been remarkably inept in developing the political, social, and organizational innovations to create an environment conducive to the effective use of advancing technology. As computer and telecommunications technologies continue to converge, this is particularly the case with telecomputing and networking in education.

The purpose of this paper is to identify patterns and trends in telecomputing and networking, following the models described in this document, as well as other models; and to describe some of the nontechnological issues associated with design, development, and implementation of telecomputing and networking in education. The need for such an analysis became apparent as this paper was being prepared; five of the ten authors who presented papers in September 1986 are no longer officially involved in the projects they described ten months earlier. Most of the reasons for this high rate of turnover can be attributed to a combination of political and economic issues and the volatile nature of telecomputing and networking ventures in education.

Because many of the political problems were addressed only briefly in the authors' papers, the authors and officials in other projects were contacted for updates and follow-up information. Our experience in planning, evaluating, and participating in technology projects at the national, state, and local levels over the last two decades also provided a perspective for this commentary.

To identify relevant trends and issues, we have focused the following discussion on several somewhat overlapping telecomputing families:

- National telecomputing projects
- Statewide networks
- Local or community-based networks
- Hybrid interactive distance learning projects

National Telecomputing Networks

National telecomputing networks are a phenomenon of the 1980s. Their growth in education can be attributed to some of the same factors that have encouraged statewide networks. Because most of the large gateway telecommunications networks (The Source, CompuServe, and Telenet, for example) have designed and implemented systems primarily for the private sector, in most instances education has been treated as a "stepchild." As a result, some of the most successful national education telecomputing networks have had to be designed, at least initially, for specific education communities. In many respects, however, they are still dependent on the priorities of the gateway networks.

Three national networks are discussed in this section: (a) Chieffile, operated by the Council of Chief State School Officers (CCSSO) as part of NSPRA's ED-LINE, which relies on The Source; (b) SpecialNet, operated by National Systems Management, Inc. (NSMI), which uses Telenet; and (c) the McGraw-Hill Information Exchange (MIX), operated by McGraw-Hill. While each of these networks is similar in some respects, each has approached the education market somewhat differently in addressing political, economic, and related problems.

The economic issues surrounding national networks must be the primary concern—especially pricing. NSMI has used "subsidies" and user rates as components of its pricing policy. The subsidy has included marketing support from the National Association of State Directors of Special Education (NASDSE), which encouraged state and local agencies to purchase a combination of equipment, connect time, and other components of the network. Over time, differentiated pricing has evolved (for example, if a state is willing to handle administrative functions, then districts get a 50 percent reduction in their rates); a similar arrangement exists for large school districts, which can get rates as low as $35 per building. Chieffile relied heavily on a combination of CCSSO-subsidized network operations, including an NIE grant to establish an information-sharing system and SEA payments for connect time. The MIX network used actuarial rates to develop a pricing arrangement calling for a specific user charge per access, regardless of amount of time used. MIX is now partially subsidized by the state of Minnesota.

While the fixed price per access certainly assists schools in budget planning and forecasting, being able to peg a price becomes risky for the network operation. Government subsidies—either at the federal or state level—can absorb initial costs and increase the critical mass of subscribers, but the network operator is often faced with the vagaries of government funding. In fact, after NIE funding ceased for CCSSO, Chieffile's state files have not been updated, and its key operator subsequently left CCSSO.

Because federal funds were used at different stages to support network implementation, Chieffile and SpecialNet were subject to political allegations. During the 1970s, ARPANET, the largest network of its kind, was in jeopardy because it was alleged to have contributed to the movement to impeach President Nixon. Both CCSSO and NSMI have successfully shielded their networks from such potential problems during the 1980s.

One of the objectives of NSMI has been to provide users with peripherals, communications software, and other services (including training) to reduce on-line time and to minimize connect-time charges. In its attempt to provide additional services, such as software downloading, NSMI has not been able to obtain the necessary support from the national networks, because the education market is not a clearly established priority for many of them. MIX recently provided editorial and other support to bulletin board and data-base operators; this approach is different from that of SpecialNet, which relies on bulletin board operators to absorb the time and other costs of operation.

Each of the systems is based on structures within which the network operates. For example, SpecialNet and Chieffile relied on an organizational structure (NASDSE and CCSSO, respectively) to facilitate initial subsidies, marketing, and support activities, factors that key individuals from both groups feel have been critical to their success or failure. MIX, on the other hand, relies on the sales, marketing, and support structure of McGraw-Hill to meet the existing market demand. Marketing of Einstein involves some new creative strategies by Addison-Wesley. In general, Chieffile and SpecialNet use a structure to *create* a market, while MIX relies on its existing structure to meet an *existing* market demand.

Officials within each of the networks feel that their challenge is to identify target audiences and to ensure that these audiences get the information they require at a reasonable cost. This challenge is a continuing one, because both audiences and their information needs change over time. The one constant factor that appears to contribute to each of the networks' success has been the ability for peers in other states, districts, and locations to communicate—through two-way bulletin boards and electronic mail—regarding common areas of interest.

Over time, a number of management issues have arisen with respect to each of the networks. For example, NSMI has addressed the issue of information control by operating a number of closed bulletin boards in addition to their open ones, and has enforced guidelines on advertising on the network, particularly by private-sector subscribers. A major issue regarding control on Chieffile has been finding ways to minimize duplicative information gathering. An internal review committee, similar to that used in FIRN, was established to conduct periodic reviews of information requests.

Support management is also a big issue, particularly with regard to training and technical assistance. The implementation of Chieffile was based largely on the assumption that individual state superintendents, if adequately trained, would use the system. The actual systems operators (that is, other state staff) were not, therefore, the focus of initial training and support. NSMI has attempted to develop a support structure, relying heavily on state-level operators and projects, to provide training and follow-on support to districts using SpecialNet.

State-Level Administrative/Telecomputing Networks

By 1970, more than 60 percent of the school districts and virtually all state departments of education had one or more automated administrative reporting system(s). The initiation of these systems was prompted by (a) the availability of mainframe computers, relying on relatively low-cost telephone data transmission capabilities; (b) the need to meet federal reporting requirements related to legislation passed during the mid-1960s; and (c) state funding formulas that allocated funds based on information reported from districts. Where state funding for district-specific programs (such as special education and vocational education) was based on student counts, the number of certified teachers, and other variables, these types of LEA/SEA reporting systems were relatively responsive and accurate, due to the potential for state and federal audits.

During the 1970s, a number of states attempted to develop comprehensive, multipurpose LEA/SEA networks, some of which involved telecomputing. The largest and most sophisticated of these was Minnesota TIES, which had many of the functional capabilities of sophisticated systems today. With the advent of microcomputers, TIES and other statewide reporting systems were forced to consider the trade-offs involved in using large mainframe or dumb-terminal systems versus microcomputer-based systems. Political battles between advocates of the two systems often ensued. Indeed, in many areas in which comprehensive mainframe systems were not in place, establishing microcomputer-based administrative reporting systems was easier to accomplish, either in specific program areas (special education, vocational education) or on a statewide basis.

During the 1980s, the number and variety of statewide administrative/telecomputing networks increased dramatically, for several reasons. First, the hardware base (including terminal equipment) increased rapidly at the district and school-building levels. Second, due to advances in telecommunications technology, alternative means of transmission, including fiber optics, videotext, and satellites, became available. Third, deregulation by the FCC opened new opportunities (such as the FM SCA, SAP, and other previously "protected" channels), and the divestiture of AT&T created additional communication alternatives. Fourth, and probably most important, during the mid-1980s, the major hardware vendors in the education market began to promote statewide administrative/telecomputing networks in response to state-level requests. These vendors gravitated toward a concept that was different from their original architectural designs (for example, Apple's bottom-up, stand-alone approach versus the large mainframe vendors' top-down, centralized configuration). And last, during the early 1980s, as microcomputer and telecommunications technologies converged, governors and legislatures began to see states as playing a pivotal role. In the area of telecommunications, their role in centralized information gathering and dissemination could be easily justified based on economies of scale. Hence, in most states, state administrative/ telecomputing networks have become a priority.

The statewide networks currently in place (as well as the many more in the process of being implemented) vary widely because of state priorities and other factors. During the mid-1980s, West Virginia established a statewide instructional network designed to facilitate communications among instructional staff at all levels and to distribute licensed or public domain software for instruction, especially in vocational education at the secondary level. The initial system relied heavily on Job Training Partnership Act (JTPA) funding; strong leadership from the legislature not only arranged for JTPA funding, but also assisted in the design of the system's architecture. Subsequently, this system has expanded to include other instructional areas and to provide administrative reporting, with the goal of cutting paperwork by more than 50 percent by 1990. Currently, Georgia is pilot-testing a comprehensive administrative reporting system in several sites; similar systems are being planned or implemented in Nebraska, New York, and North Carolina, among others. In other states, telecomputing networks that include minor administrative reporting (student, personnel, and financial data, for example) rely on a variety of telecommunication gateways or networks (Texas uses Electric Pages; Kansas, SpecialNet; and Minnesota, McGraw-Hill's MIX).

Two of the statewide network systems described in this book, FIRN (Florida) and EdLink (New Hampshire), represent two different types of networks. They can be considered models in terms of their functionality as well as their planned strategies for design and implementation.

FIRN

FIRN—the Florida Information Resource Network—is probably the most comprehensive statewide reporting system in education today. FIRN has succeeded by addressing a number of factors that have plagued network implementation in other states. First, although FIRN was officially created and funded by the legislature in 1982, initial planning—particularly at the Department of Education and local district levels—began over a decade earlier, through the creation of the predecessors of the School District Council for Comprehensive Management Information Systems. The increased authority, over operational problems in particular, of this group and the FIRN Coordinating Council, which was formed to establish policy and guide future development, became critical in the implementation of FIRN.

Second, as noted in the Watson paper, approximately half of FIRN's applications are designed to assist local districts, while the remainder are designed primarily to assist state officials in their monitoring and reporting functions. Because districts would be using FIRN data bases for their own purposes, this balance contributed significantly to incentives to enter accurate data into FIRN. Moreover, many of the initial types of data reported to FIRN were used by state officials in apportioning funding to the districts, another incentive to ensure quality and timely reporting of data from the LEAs.

Third, most historical studies of state departments of education and their relations with local districts rank Florida among the most centralized and politically active in the country. Implementation of FIRN within this context is remarkable. While Watson notes that some political problems arose (suspicions between different agency types linking autonomous agencies into a unified network, for example), the planning and oversight structure, along with the open involvement of the legislature in the planning and implementation of FIRN, provided opportunities for political issues to be resolved through open discussions.

And finally, mechanisms were established to ensure that implementation of FIRN would not be misdirected or otherwise jeopardized. In some states, the implementation of statewide reporting systems has been severely impaired because state education agency officials initiated "ad hoc information-collection activities," thus eroding the overall credibility of the automated system. To avoid this problem, a subgroup within the FIRN council was required to approve any Department of Education information request and, if any local district received a form that was not specifically approved by the council, the districts were not obligated to complete it.

EdLink

The context in which the New Hampshire EdLink network has been implemented differs from that in Florida. Traditionally, New Hampshire has been a "local autonomy" state, with less than 10 percent of education funding derived from state or federal sources. The state department has minimal leverage for instituting statewide administrative/telecomputing networks. These realities have required careful planning and sensitive implementation during the last year.

One of the factors contributing to EdLink's success has been the underlying philosophy that such success will be directly related to the perceived benefits to users, who will express their satisfaction by paying for the information (via hardware and connect-time costs). Moreover, because EdLink is a user-driven system, the identification of user information needs is based on an iterative process, as information requirements continually become known to the state-level systems operator.

Another factor contributing to New Hampshire's success was the lack of a statewide mainframe reporting system prior to the introduction of the microcomputer. This allowed planners to take advantage of the emerging microcomputer base without encountering resistance from mainframe advocates.

As Vaughn notes in his paper, New Hampshire's planners recognized the need for training superintendents and others during the pilot phase. According to Vaughn, because the AppleLink system was so easy to use, the training process was considerably less troublesome than with other systems.

Cognizant of the political sensitivities involved, the state's planners also ensured that the network, particularly the two-way bulletin board system, was completely open to all users. While certain "folders" were designed for specific user categories (superintendents, microcomputer coordinators), any user could have access to other folders for general information gathering and posting. This openness also provided opportunities for the creation within the network of "communities of users" that shared information with their peers, a capability that Vaughn argues has contributed most to the network's overall success.

And last, the New Hampshire EdLink network is a model of participation between the education community and the private sector—in this case, Apple Computer. Apple not only provided special rates for equipment, but also contributed approximately 4,000 hours of free connect time per month during the pilot demonstration. Apple support continues today, with the possibility of developing some data bases on AppleLink that are specifically related to New Hampshire.

The EdLink model has been tested in Mississippi, and expansion is planned for ten to twelve additional states in the immediate future.

School/Community-Based Networks

Four authors describe projects that fall into this category. Even though the Maryland Education Technology Network (METN) is often perceived as a statewide telecomputing system relying on broadcast distribution of software, the heart of the project today is 30 local area network configurations in as many schools. The MacJANET system used at the University of Waterloo and elsewhere represents a local area network used primarily as a tool for the teacher to distribute software. The CMS School-Net system, described by Rogers, differs in many respects from the other two systems in that its major purpose is to provide teachers and students with opportunities and motivation to "write" to each other over the network. Learning Link is a multipurpose, community-based network that, in addition to providing telecommunications, offers subscribing schools access to a software review data base and procedures to be used to select and order software. Both MIX and Addison-Wesley's Einstein can be accessed through Learning Link, which has been adopted for use by the Software Communications Service, a consortium of SEAs and public television stations in more than 15 states.

Before I discuss some of the problems and issues associated with these and other networks, however, several comments about current local area network (LAN) trends are appropriate. Interest in school networks has increased dramatically in the last two years. In 1985, for example, TALMIS reported that 14 percent of its school respondents used microcomputers in one or more network configurations—2 percent at the elementary level, and more than 33 percent at the senior high level. A district-level survey of the largest districts (enrollment of 25,000 or more), conducted by Quality Education Data (QED) in 1987, reported that 53 percent currently used local area networks, with an additional 30 percent planning to use networks by 1990. Arguments in favor of networks include savings on software costs and reduced use of aides to provide group instruction. Negative comments usually relate to the expense of the system, its complexity, and the lack of generic instructional management systems.

An increasing number of vendors are also promoting "hardware independent" network systems, a concept that is very appealing to cost-conscious school officials. Such systems allow schools to use existing microcomputers to "experiment" with networking. Over the last year, the number of software publishers who license their software for use on networks has doubled, with the greatest increase occurring among small to medium-sized K–12 education publishers. Lest illegal copying erode their consumer market, only a limited number of traditional consumer software publishers have agreed to license their software for use on school networks.

While the price of network versions of software packages two years ago ranged from two to ten times the retail price of a single unit, most pricing arrangements are now about five times retail for a typical local area network license.

A number of economic and social issues are associated with local area and community-based networks. Some of these issues and related ones can be gleaned from the papers in this document. One of the major economic issues is the cost of purchasing, installing, and operating a network. Most of the early networks had price points that were exceedingly high. For the initial five demonstration sites in the METN project, state officials were able to obtain an agreement from IBM to provide both hardware and software to sites on loan. MacJANET, at the University of Waterloo, made extensive use of existing workstations, while the grassroots nature of CMS SchoolNet relied heavily on existing hardware. As an alternative to legislative appropriations to support expansion of METN, project staff developed a marketing concept, referred to as the Maryland Instructional Resource Center (MIRC), that would allow various groups and individuals to use the school network facilities after regular school hours to provide adult literacy, training, and other programs on a user-fee basis. The fees would be distributed among the local school district and participating vendors, including the telephone company, to create a reserve from which future expenditures for METN expansion could be drawn.

One of the reasons many school officials are interested in hardware-independent networks is that they can utilize existing hardware to experiment with local area networks, often for a total out-of-pocket cost of between $6,000 and $12,000. Some companies, such as VELAN, Inc., provide their software configuration on a 90-day approval basis.

Other economic considerations are installation, training, and operating costs. All parties involved in the METN project initially underestimated the cost of training and operations. While none of the sites budgeted for a full-time person to operate the network, in virtually every site at least one full-time operator was needed initially. It is noteworthy that both ESC and Tandy include as an option a full-time person to operate the network and train school staff for a period of nine months.

Another often overlooked cost associated with networks is the nonproductive time of regular teaching staff. For example, in its comparison of network versus stand-alone instructional configurations, the CATE study included that portion of a regular teacher's time spent moving students between the elementary classroom and the lab, as well as the additional time the teacher observed as the lab instructor taught the students. This was one of the factors contributing to the significantly higher cost per student hour in a computer lab network configuration than in a stand-alone situation (CATE, 1986). These relatively high costs, however, should be reduced dramatically in network setups that have "pods" physically located in various classrooms and integrated into curriculum areas and that rely on the classroom teacher for instruction.

Also differing among the projects are a number of social issues associated with local and community-based networks. For example, the original JANET system, which relied on IBM PC computers, and the follow-on MacJANET, which uses Apple Macintosh computers, were both designed to minimize teacher anxiety. Durance felt that a network would be an even bigger "black box" than computers themselves, and more threatening to the typical teacher. Hence, the network software was designed to be a tool for the teacher, assisting her/him to distribute software to workstations. The system was not designed to provide instructional management capabilities, track student progress, or provide electronic mail communication between students on the network. The METN project, on the other hand, increasingly relied on a management system (PC CLASS) that provided opportunities for teacher management of the instructional process. The CEMCORP METN configuration—and, to a lesser extent, the IBM configuration—was designed to facilitate student interaction within the network and, via modem, with other sites. The social issues related to teachers' roles in implementation differ significantly.

As Rogers notes, the CMS School-Net approach has been a sociological, not a technological, challenge. "A successful communications experience will occur only within the context of a carefully nurtured social situation that attends to certain critical sociological factors. It is possible to be a social isolate and be successful with a word processor, data base, or spreadsheet program. However, in a communications experience via modem, you must be part of a social structure. That is to say, there must be someone on the other end with whom you communicate."

The CMS School-Net approach was based on Riel's study of essential ingredients in successful networking experiences. These included the following requirements:

- There must be a task to be accomplished.
- Telecommunications must be easier and more effective than other means to accomplish the task.
- Participants must know each other.
- Participants must be committed to the task, and some degree of accountability must exist.

By all accounts, the CMS School-Net system has been successful. Even though the San Diego Teacher Education Center was closed following recent budget cuts in education technology, CMS School-Net continues to expand. Although the TEC-operated bulletin board has been discontinued, virtually all of its functions have been delegated to other nodes in the network, and a number of other groups (such as CUE) have agreed to contribute funds to pay for long-distance costs of the network. Despite CMS School-Net's success and its theoretical design, however, the opportunity to learn more about the sociological implications of telecomputing through in-depth research and evaluation appears to be lost for the present.

The design and implementation of Learning Link has, from an economic and social perspective, been very innovative. The iterative process used to design the system over time to meet user needs is somewhat unique. Reliance on off-the-shelf equipment and existing subscriber-school equipment bases, and the use of existing telecommunication infrastructures (for example, WNET data transmission capabilities) have resulted in a relatively low telecomputing cost. Moreover, the system software that makes it possible to access the services of other on-line data bases—such as MIX—provides opportunities to fulfill unique subscriber needs. Expanded consumer interest and satisfaction with Learning Link is reflected in the relatively large number of public television agencies and state departments of education, including the Software Communications Service, that have recently adopted Learning Link as an integral part of their multistate networks.

Interactive Distance Learning/Telecomputing

During the last two years, the number of students participating in distance learning projects has increased at a greater rate than has the number of students receiving instruction via microcomputer during the early 1980s. Distance learning models usually involve the following components: (a) interactive video, audio, and graphics; (b) satellite or other broadcast means; (c) a master teacher in one location; (d) students at remote locations (schools) with broadcast receivers; and (e) student access to microcomputers for drill and practice. The growth of distance learning projects over the last year can be attributed to a number of factors:

- Telecommunications, microcomputers, interactive video, and other related technologies are converging.

- Significant prior investments in broadcast ITV and cable systems have led to the availability of a telecommunications infrastructure within the states and regions, providing opportunities for distance learning with minimal startup costs and low marginal operating costs.

- Through the use of master teachers, distance learning often provides the only opportunity for students to receive courses that are now required in many states (because of increased standards for graduation) and to take advantage of the rapidly growing Advanced Placement Program.

- In rural, poor, and small districts facing consolidation, distance learning provides in many instances the only economically viable alternative for meeting state requirements, and thus survival.

Some of the same states that took a leading role in the microcomputer movement have initiated path-breaking distance learning projects. Distance learning in Utah has focused on language instruction in Spanish. Sponsored by the Utah State Board of Education, the Bonneville International Corporation, and IBM, this pilot study relies on low-cost, wide-coverage satellite transmission, master teachers, two-way audio, and one-way video, with opportunities for direct student interaction using microcomputers in a local area network. In Minnesota, seven small school districts have formed a distance learning consortium that relies on two-way fiber-optic video for transmission. Courses are offered in Spanish, French, accounting, and music. A major objective of this project is to access the increased quality of video, telephone, and computer transmission using fiber optics, which is more expensive than hard cable or microwave.

While some states have relied on traditional public broadcasting systems (Michigan's use of Central Education Network programming, for example), other states have established relationships with private firms. Texas has arranged with Ti-In Network Incorporated to provide distance learning to approximately 100 districts within the state. Ti-In provides instruction via satellite from master teachers in the TEA Region XX Service Center studio to the districts, which pay approximately $15,000 for equipment, monitors, printers, and telephone costs during the first year; subsequent annual costs are about $10,000. Course offerings cover a wide range of curriculum areas and include staff training and personal business offerings for teachers.

The papers by Bramble, Southworth, and Stoll describe three variations of interactive distance learning/telecomputing in different environments with somewhat different objectives. These papers raise a number of political, regulatory, and other issues that must be confronted if the effective use of this technology is to be realized. As Stoll notes, "Several policy and legislative issues have arisen as a result of this transformation process, because many of the current laws, policies, funding mechanisms, and regulations do not encourage or support the emergence of a new educational delivery system."

While expanded distance learning activities can be attributed directly to political issues (increased graduation requirements, focus on at-risk populations), distance learning is often politically threatening to existing institutions. Compounding the economic constraints that severely hampered Learn Alaska, a number of political issues were identified by Bramble that together represented a formidable force: (a) teacher union resistance because of the potential impact on employment; (b) college and university resistance due to perceived losses in attendance and hence revenue; and (c) growing opposition from public broadcasters. As Bramble accurately noted, to gain acceptance distance learning has to be implemented as a supplemental activity rather than as a replacement of existing functions; on the other hand, this political consideration results in extensive implementation, often without the potential being realized. In discussing the various Hawaii projects on international telecomputing, Southworth notes that a large number of associations and professional groups are involved in establishment and implementation. Such involvement of national and international associations represents a political force that can overcome some of the political problems that occur throughout various phases of the projects.

The economics of distance learning/telecomputing depends on the in-place infrastructure at both transmitting and receiving locations. Many of the New York state projects are projected to be extremely cost-effective because of existing infrastructures (for example, installed district-level cable, numerous transmission capabilities). On the other hand, Learn Alaska represented—in its early years—the creation of an infrastructure whose capabilities were expanded beyond instructional television to audio conferencing, which continued to operate despite the serious shortfall in revenue caused by the depressed price of oil and gas. The Learn Alaska experience is also a prime example of the difficulty of obtaining long-term funding support for a telecomputing/distance learning effort "once the glamour of new equipment purchases has faded."

Design and implementation of distance learning/telecomputing programs, more so than projects involving computers, has raised a number of regulatory issues—interstate as well as international. One of the major impediments to the use of distance learning in teacher training projects in New York has been the difficulty of providing credits for teachers receiving instruction, across state boundaries, from a master teacher not certified in New York. While it is possible to obtain waivers for specific telecomputing projects that transmit across national boundaries, existing tariff and other regulations can constrain expanded implementation. The Software Communications Service, a consortium of more than 15 states and Canadian provinces, is planning to transmit electronically—mostly through broadcast means—commercial software to participating states/provinces and school districts. However, the U.S. Department of Commerce has been unable to answer questions as to whether or not tariffs would be imposed on packages that are broadcast over national boundaries. Other regulatory problems regarding international telecomputing include the lack of standards for video transmission and length of school day requirements that vary among countries.

As Stoll notes, for a variety of technical, political, and other reasons, distance learning/telecomputing usually involves many entities (state education agencies, local districts, intermediate units, cable companies, private and nonpublic broadcast and transmission agencies), which in itself taxes the ingenuity of planners in developing organizational and managerial, not to mention political, innovations to ensure effectively implemented programs.

Closing Comment

This commentary purposely focuses on the nontechnical problems and issues associated with telecomputing at various levels, based on authors' descriptions of projects and on subsequent discussions with them and other knowledgeable officials. As several of the authors note, the major challenges are in these areas, not the technology itself. If the potential of telecomputing, distance learning, and other projects is to be realized, now is the time to begin addressing these problems at the various policy levels.

Charles L. Blaschke

Over the last two decades, Charles L. Blaschke, president of Education TURNKEY Systems, Inc., has provided assistance and consultation to more than 1,000 local school districts, most state departments of education, several federal agencies, and numerous publishers and hardware manufacturers in various areas related to emerging technology use in education. TURNKEY has recently assisted more than 35 state education agencies in developing plans for technology use in instruction and telecommunications, and is currently assisting 18 states and four Canadian provinces to design a national consortium to aggregate markets for educational software.

Mr. Blaschke recently completed a study for the Office of Technology Assessment on the history of federal research and development support for education technology, and is presently conducting a study of current and projected computer use in the Job Training Partnership Act system for the National Commission for Employment Policy. A 25-year veteran of the computer-based education movement, he received his B.A. in economics from Texas A&M University and his Masters of Public Administration from the John F. Kennedy School at Harvard University.

EUREKA!

(from *An Electronic Net-Rider's Journal*)

Gerri Sinclair

Last fall, I was in Bulgaria to speak at a conference called Varna II, a symposium of business leaders from Europe, the United States, and the Eastern Bloc countries. It was about six weeks before Gorbachev and Reagan were due to meet for their summit in Geneva, and there were a number of Soviets at this conference. In my presentation, I said that we had no way of knowing what the outcome of the summit would be, but wouldn't it be wonderful if technology were not the thing that divides us, but the thing that allows us to bridge our differences? Wouldn't it be wonderful if we could pick something that was as nonthreatening as education, and pick a technology as new and innovative as the personal computer, and let that be the way that our two societies worked together?

John Sculley, President and CEO
Apple Computer, Inc.
Cupertino, California U.S.A.

In Russian language there is such a term as "the eternal student." For the moment it's a negative term, descriptive of the student who can't finish his education for many years. But now I think it's necessary to review the meaning of this term. In the area of increasing information flow, everyone must be "the eternal student" in order to be Just in Time—you see? And moreover, only computer education through worldwide networks can approach us to the World Mind (sorry, I don't know the terminology) and only the World Mind can help humanity throw away such things as war, hunger, ill blood.

Dr. Sergei Alexandrow
Institute for Automated Systems
Moscow, USSR

For as long as I can remember, I have done my best thinking while soaking in a hot bath. Usually I am alone in the tub when my most innovative ideas begin to take shape. Once in a while, however, I have landed a profound insight while sharing my bath with the most unlikely of companions.

Consider my experience in the hot pools at the Top of the World. For those unfamiliar with the secret geography of the Canadian Rockies, these natural undeveloped springs are located on a steep hillside in the East Kootenays, 20 miles off the highway between Vancouver and Banff. I had hiked there with Jerry Morgan, a local expert on higher-order thinking skills, and Jan, his painter wife, along a narrow path that skirted a ravine—a fairly perilous route at the best of times, and even more dangerous in the dark. Our plan was to spend a restorative hour or two under the crisp, clear, star-filled alpine night soaking in the privacy and comfort of the natural pools. I had just conducted a day-long teachers' workshop on "Electronic Networking as a New Paradigm for Thinking," and I was looking forward to relaxing with my friends, undisturbed by anything more than the occasional satellite streaking silently between the peaks.

As we arrived, however, my plan was shattered by a string of obscenities and a peal of raucous laughter that seemed to issue from the depths of the springs themselves. We were not, it seemed, alone at the Top of the World. Already immersed were four naked and inebriated young coal miners and a soggy German shepherd, all of whom greeted us with a display of boisterous enthusiasm. This jovial and generous crew were not at all backward in offering us refreshments from their large cooler filled with beer and hard liquor. The dog looked up at us soulfully, then bounded out of the water and shook himself out vigorously at our feet. Drenched to the skin in the chilly night air, the three of us had no choice but to join the party.

When I arrived back at my hotel room just before dawn, I connected my portable computer to the telephone and went on-line to report on my day's activities. Among members of the electronic community there is an implicit understanding that whenever one of us attends a conference or workshop, we find time to summarize the highlights and upload them to the "nets." These electronic reports are, in turn, ported to other networks so that the entire community remains currently informed of recent developments in an expanding knowledge base of personal and professional interest. My report contained a brief summary of my "Networking as Thinking" workshop, and a lengthy description of how I had spent the night in a natural hot spring with two friends, four drunks, and a dog.

I sent my report off to several networks—one in Europe, two in Canada, three in the United States, and one in Japan. The latter, an English language network in Tokyo, called Twics, hosts over 200 computer conferences that reflect the far-ranging interests of its multicultural user base. The most active conference on Twics is called "In the Ofuro" and serves as the hub of the network. The Japanese word *ofuro* means "hot bath," and the conference invokes the metaphor of the Japanese communal bath to create a socially relaxed electronic meeting space for its geographically dispersed participants. The first note in the Ofuro conference creates the electronic ambience:

> Aaaaahhh...Ease on into the hot steamy ofuro, close your eyes and listen to the murmur of the people around you. Women, men, young, old. All relaxed and uninhibited, letting their words flow like the sake and the hot water you are all enjoying...

It was to this conference that I sent the description of my recent adventure in the hot pools at the Top of the World. The next afternoon when I arrived back home in Vancouver and connected my computer to Twics, I found a message waiting for me from Jeffrey Shaphard, the system's operations director. "Jefu," as he is known on the nets and throughout Japan, is an English instructor committed to promoting global networking as a tool for intercultural understanding. His response to my ofuro story illustrates the interactive "process learning" that typically occurs on-line. Reading Jefu's message was tantamount to taking an electronic field trip to Japan (with a short side trip to Missoula, Montana):

> Gerri,
> Actually the hot springs experience you describe is very Japanese. My mother-in-law and father-in-law would have loved it. (My wife is too modern, so she is too modest to get naked with strange men, or at least, men stranger than me.) And drinking and getting raucous while bathing? Why, that is a TRADITION here, although women bathers are a bit more sedate.

> Until the "modernization" of Japan, and more recently the American occupation, all bathing in Japan was public—men and women together in one big tub. Homes until recently were too small to have their own tubs, and so everyone went down to the neighborhood o-sento for their nightly bath, a neighborly experience. And, of course, hot springs were the same.
>
> And then came "modernization" (aka "westernization") with all its biases and inhibitions about naked human bodies, and a curtain was put up, then a wall, between the men and the women for bathing. Now you have to go way out in the boonies to find a hot spring that still has mixed bathing, or find a natural one. The most enthusiastic bathers are old ladies, but recently it has become fashionable among young female office workers (called OLs for "office ladies"), and so once the young men get over their own inhibitions, perhaps this institution will return. Near the town where I went to college in Montana—Missoula—there was a renowned natural hot spring up on Lolo Pass called Jerry Johnson hot spring. Folks even used to ski into it from the road in the winter, the best time for hitting the hot water. I am glad you got to the Top of the World.—Jefu

The day after I received Jefu's message, two friends from Tokyo arrived at my home on their way to California. Although this was the first time I had met either Milo or Machiko face to face, I had been soaking electronically beside Milo in the Twics Ofuro for several months and had, sight unseen, invited them both to stay with us during their brief stopover in Vancouver. That night at the dinner table, I could not resist telling them of my recent adventures in the hot pools. They enjoyed hearing the story, especially the part about the German shepherd, and Machiko went on to describe the escapades of the famous snow monkeys of Northern Japan who frequent the hot springs near Hokkaido in the wintertime. She also explained how bathing in hot springs was an age-old tradition in Japan, but a tradition that has been dying out.

"Things are changing, however," continued Machiko. "The tradition of the public bath is being revived lately by a new group called . . ."

"OLs," I chimed in, finishing Machiko's sentence together with her. Machiko and Milo were both amazed.

"Where on earth did you ever learn about OLs?" they asked incredulously.

"I didn't learn about OLs on earth," I replied, flashing them my best Mona Lisa smile. "I learned about them on-line."

Later that night, after everyone else had gone to bed, I poured myself a hot bath and a hot cup of the sake that my guests had brought from Japan. As I lay there meditating on the educational potential of global networking, an old nursery rhyme bubbled up unbidden from the wellspring of my childhood memory. I noticed in passing that the words had undergone something of a sea change, but then again, so had I:

Rub a dub dub
five men in a tub
two women and a dog forlorn
but not to fret
out of that set
the "electronic field trip" is born.

Jefu and I initiated our first formal electronic field trip a few months later, setting up two sister computer conferences, one on the Twics network in Tokyo, the other on the Simon Fraser University network in Vancouver. Our purpose was to test the concept of the electronic field trip, traveling electronically to another culture to gather firsthand information and experience. We were attempting to stretch the concept of distance education across national and continental boundaries from my base in the SFU Faculty of Education, where I was in touch with a group of students learning to teach English as a second language, to the International Education Center in Tokyo, where Jefu was in contact with a group of Japanese adults learning English.

We decided to link the two groups electronically through a distributed computer conferencing system. It worked like this: The Japanese group sent their messages and responses to Twics in Tokyo, while the Canadian group sent theirs to the SFU network. Every two days I ported the messages between the two networks, gathering up those on the SFU network in batches and transmitting them to Twics at night, when rates are lowest. After uploading the messages from the Canadian group, I then downloaded the messages from Twics and added them to the sister conference on the SFU network.

The "B.C. to Tokyo Bridge" was a popular success. Although the opening discussions, focusing on such topics as "the pedagogy of learning English as a second language," proved to be a bit turgid, the "bridge" began to light up when participants on both sides of the Pacific started to speak to one another on a more personal basis. Soon individuals were talking about their families, their favorite restaurants, and what they did for fun. They compared the roles of women, the use of caffeine, the latest dieting fads, and the costs of a game of golf in Canada and Japan. One of my teacher education students described the consternation she experienced as a result of being the child of former hippy parents who still insisted that she eat only healthful food like granola and brown rice. Several of the Japanese entertained us with gripping tales of Tokyo trains in the "crush hour," subtitled by one Twics member as "stories of commutation hell." Participants on both sides left the conference having discovered a compendium of interesting and intimate information about daily life in another culture. Without leaving their own geography or time zones, some of them became close friends.

The B.C. to Tokyo Bridge was not my first experience with global educational networking. The previous summer I had coordinated an International Kids-to-Kids computer network that linked young people around the world. Hearing of this project, Hallmark Cards had approached me with an offer of an Electronic Peace Greeting Card program to support my efforts. Children in various parts of the world would use Hallmark's ColorMail software to design peace messages animated with computer graphics, sound, and color. These greeting cards would then be uploaded to CompuServe Information Services to be stored and retrieved electronically by children in other parts of the world. Hallmark designed a special peace library of international phrases, songs, and symbols in honor of the project, and made their software available for several international sites. CompuServe cosponsored the event by providing electronic mail accounts and free access to students at participating sites around the world.

In June 1986 I traveled to the USSR to arrange for the participation of Soviet students in this project. I left for Moscow outfitted with an Apple IIc, a modem, Hallmark's ColorMail software, and several floppy disks full of peace greetings created by kids in Vancouver, Victoria, and Seattle. I made the trip with my friend Diana Glasgow, one of the founders of the Earth Stewards' network, a global-community group devoted to using citizen diplomacy and conflict-resolution strategies to promote international understanding. My work with the Kids-to-Kids electronic network happily coincided with the work of the Earth Stewards, who were setting up cultural exchanges between students in the United States and the USSR.

Diana was going to Moscow to lobby for permission from Soviet authorities to send 20 Soviet teenagers to the United States to stay with American teenagers in host families in Washington, San Francisco, and Seattle. Diana and her partner, Danaan Perry, had successfully led an American youth delegation to the USSR earlier that year, but up to this point the Earth Stewards had not been successful in persuading the Soviet government to permit Russian children to pay a reciprocal visit to the United States. This time, however, the Earth Stewards were offering a cultural exchange program that was difficult for the Soviet officials to resist: an educational tour package that promised extensive hands-on experience with the latest American educational technology—computer games, computer music, computer graphics, programming languages, and telecommunications. Diana had enlisted me as their project's computer networking adviser, and was acting as my coach and adviser on what to expect and how to behave when I landed in Russia.

Believe me, I needed that coaching. I will not speak of the incredible problems I had with officials on both sides of the border. I learned that an identical mind-set is shared by U.S. and USSR customs authorities. Neither country is warmly receptive toward a Canadian citizen bringing an American microcomputer into the Soviet Union. Let us say that eventually I made my way, though, complete with computer and software, and found myself conversing with a great range of Soviet citizens—writers, scientists, university professors, film-makers, students, teachers, journalists, and diplomats—many of whom sought me out in order to discuss my plans to use computers to connect kids across the barriers of space and culture.

Perhaps the most memorable of all the individuals I met was Joseph Goldin, a multimedia activist whose visionary stratagems are focused on a single informing idea—the transformation of global consciousness through communications technology. He calls this idea "The Mirror of Humanity," a giant diamond screen in every major center in the world with cameras directed outward toward the viewing audience. Through this mirroring technology, he explains, it becomes possible for individuals in Moscow or New York to look out at a street in New Delhi and see themselves projected into that street scene. "Cultural transformation through teletransportation"—that's how Joseph sometimes defines his vision. Here was a more grandiose version of our electronic field trip.

One afternoon, Joseph took me to see the giant screen in the old Arbat, a 19th century street in Moscow on which stands the house where Pushkin was married, and which has been recently restored as a pedestrian mall. In the center of this street, not entirely out of place, looms a giant diamond screen. Joseph has used this screen as a vantage point from which to mount "electronic town meeting" events. A few weeks before I arrived, Joseph had orchestrated a Mirror of Humanity production, which involved placing cameras inside the obstetrical ward of a large Moscow hospital and projecting the images of mothers, fathers, and their newborn babies onto the giant screen above the old Arbat, so that pedestrians strolling in the mall below could welcome the newest members of their community into the world.

For me, however, the highlight of my trip was the afternoon I spent with professors Oleg Smirnov, Vladimir Serdiuk, and Sergei Alexandrow at the Institute for Automated Systems, a branch of the Academy of Sciences of the USSR. After they promised to set up an account for me on Academnet, the computer conferencing system that will link educational institutions throughout the country, Dr. Smirnov, the director of the IAS, permitted me access to one of the few open lines to the West in order to send a message to my networking colleagues on the Simon Fraser University host computer in Vancouver. Were they impressed!

I was also able to get to the Moscow computer club and work with a group of enthusiastic Russian kids who used my Hallmark software to design electronic peace greetings to send to kids in the West. When I returned to Vancouver I carried these greetings with me. I uploaded them to CompuServe, where they were stored and exchanged with those of approximately 450 other young people from many national groups in different parts of the world.

From our home base at the United Nations' pavilion at Expo '86 in Vancouver last summer, the Kids-to-Kids computer network organized and participated in many other international electronic events. We hosted several intercontinental games of "The Other Side," a conflict-resolution simulation developed by Tom Snyder Productions, which we played via computer and modem linked up by telephone to teams of students in Canada, the United States, and Australia. In July, we represented Canada in the World Future Society's special session on global education in a three-way audio, slow-scan TV, and computer linkup between sites in New York, Tokyo, and Vancouver. On August 6, Hiroshima Day, SFU was one of the host sites for a three-hour global teleconference that connected more than 100 students in 15 countries in a discussion about "preparing the planet for the year 2000." We also organized a real-time computer conference on the Simon Fraser University network between Jerry Morgan's students from Invermere, B.C. (only a few valleys away from the Top of the World hot pools) and a group of Catholic and Protestant young people who were working together on a peace farm near Belfast in Northern Ireland.

Diana Glasgow and the Earth Stewards were successful in bringing a group of twenty Soviet students from Novosibersk (Siberia) to the United States to stay with American host families for a three-week visit. The delegation was led by academician Andrei Ershov, who has Gorbachev's mandate to bring about the full-scale integration of computers into the Soviet school system. In mid-November, during the final days of the exchange, I drove down to Edmonds College in Seattle to lead the group in a workshop on international telecommunications. During the previous week in San Francisco, Joel Schatz of Arc Communications had organized a slow-scan TV exchange between the Siberian students and a group of Soviet citizens at an "electronic cafe" that Joseph Goldin had set up just outside the Kremlin in Moscow. When I met the students face to face in Seattle, the first thing they wanted me to do was to help them send electronic messages of thanks and farewell to their host families in each of the three cities they had visited. Having discharged their responsibilities as guests, they then were delighted to settle into an afternoon of global "net-riding."

Our first stop was Canada, where I took them to my home system, the Simon Fraser University network. Here we picked up electronic greetings of welcome from various members of the SFU community, as well as a number of electronic messages that had been posted via Bitnet from well-wishers in Australia, the United Kingdom, France, Israel, and Japan. We paused momentarily to print these out before setting off for our next stop, Geonet, a computer conferencing network in Hamburg, West Germany. Here we spent some time browsing the news stories that were just breaking in the West German press, and a number of environmental items on an international bulletin board called Green-net, which was of particular interest to the Soviet students, as the Chernobyl disaster was fresh in their memories. We then visited several networks in the United States: CompuServe in Ohio, EIES at the New Jersey Institute of Technology, PeaceNet in California, and Networking and World Information (NWI) in Connecticut. The final stop on our itinerary was the Ofuro on the Twics network in Tokyo.

There is a time difference of 17 hours between Tokyo and the West Coast. It was almost 4 in the afternoon when we entered the Ofuro, which made it close to 9 the next morning, Tokyo time. The Ofuro was deserted except for George Pfieffer, an English instructor at IEC who had signed on from his office, hoping to take a quick electronic dip before his 9 A.M. class. We sent him a message asking if he and his students would like to participate in a synchronous trans-Pacific chat with the Siberian students and their teachers. We could feel George's excitement all the way across the Pacific. He ran down the hall and gathered up a group of his students, four Japanese professionals studying English for business purposes: a real estate salesman, two government officials, and a banker.

The conversation was far ranging. They discussed the rate of the Japanese yen against the Soviet ruble and quizzed each other on the oldest cities in the USSR and Japan. The Soviets were curious to know which Russian writers the Japanese had either read or heard of. Although none of the Japanese group had read any postrevolutionary Russian literature, one had read Tolstoy and Dostoevski. The Russians were hard pressed to remember the names or works of any Japanese writers, though they promised to rectify this situation immediately upon returning home. Both groups acknowledged the irony of their position. Though they are neighbors in a geographical sense, the Siberians had to travel all the way to the west coast of North America and span the full width of the Pacific Ocean in order to carry on a friendly conversation with the Japanese. But such is the world of the net-riders.

Later that evening, I talked to academician Ershov about one of my favorite topics: using computer-mediated communications to develop problem-solving strategies for global issues. This topic was of great interest to Ershov, but he cautioned that an overdependence on technology might prevent us from using other powerful catalytic resources to stimulate new ideas and new ways of thinking. He admitted that he personally did not do his best thinking at a computer keyboard.

"After I receive an electronic message or a paper from a colleague, I cannot respond immediately," he said. "I need time to think it over, to digest the contents, to mark the margins of the text with penciled notes before I have a clear idea of the nature of my response.

"When my children were young," he continued, "my wife and I, as working parents, shared the domestic responsibilities. Every evening she would prepare our meal and I would wash the dishes. I found that standing by the sink, my hands immersed in hot water, my mind idle, provided me the most fertile opportunity for clear, imaginative thinking. I would remain at the sink for several hours each evening—long after the children had gone to bed—engaged in creative, and often practical, thought."

The next evening, back home, as I lay in the bath like Archimedes with Ershov's conversation still fresh in my mind, I began making a few connections. I knew from my visits to schools within the USSR that the Russians were interested in developing a computer-based instruction system that could translate and transmit text that had been composed on Kanji (one of the Japanese scripts), English, and Cyrillic keyboards. It suddenly occurred to me that the Twics Ofuro was the best laboratory in the world for researching this problem.

"Eureka!" I shouted as I jumped out of my bath and signed onto Twics. Jefu agreed to set up IDs and passwords on Twics, and in relatively short order Vlad and Alex, two of the Soviet computer scientists I had met at the Institute for Automated Systems, were soaking with us in the on-line Ofuro.

And the result? Well, the words of our friend, Alex, which I quoted at the beginning of this essay, just happened to bubble up there recently.

Gerri Sinclair

Dr. Gerri Sinclair is a specialist in interactive multimedia technology and global electronic networking. She is a member of the Faculty of Education at Simon Fraser University in Burnaby, B.C., Canada, where she is currently director of EXCITE (the EXemplary Center for Interactive Technologies in Education). Over the last two years she has coordinated a number of international computer conferencing events, including the World Logo Conference, The World Congress of Education and Technology On-line, and the Kids-to-Kids Computer Peace Project.

A former science journalist with Saturday Night Magazine, *she has also published articles, poems, and stories in a variety of magazines and anthologies. She lives in Vancouver with her husband and two children in a large house filled with computers, videodisc players, modems, and bathtubs.*

Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, California 95014
(408) 996-1010
TLX 171-576